SAMSUNG | Rockwell Automation

NX70/NX700 Series Pulse I/O Modules (4CH) (NX70-PULSE4 and NX-PULSE4) User Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Samsung Automation be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Samsung Automation cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Samsung Automation. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances which may lead to serious personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to minor personal injury, property damage, economic loss, or product malfunction. However, depending on circumstances, failure to follow the directions accompanying this symbol may also lead to serious consequences.

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Safety Instructions

Please read this manual and the related documentation thoroughly and familiarize yourself with product information, safety instructions and other directions before installing, operating, performing inspection and preventive maintenance. Make sure to follow the directions correctly to ensure normal operation of the product and your safety.

WARNING

- If this product is used in a situation that may cause personal injury and/or significant product damage, implement safety measures such as use of fault-safe equipment.
- Do not use this product under any conditions exposed to explosive gases. It may cause an explosion.

ATTENTION

- Please fasten cables with terminal bolts.
- Do not use the product under conditions that do not meet correct environmental standards.
- Make sure you connect grounding cables.
- Do not touch terminals when electric current is flowing.

NX 700 Pulse I/O Unit Installation Environment

ATTENTION

Do not install your unit if any of the following conditions are present:

- Ambient temperature outside the range of 0 to 55 °C (32 to 131 °F).
- Direct sunlight.
- Humidity outside the range of 30% to 85% (non-condensing).
- Chemicals that may affect electronic parts.
- Excessive or conductive dust, or salinity.
- High voltage, strong magnetic fields, or strong electromagnetic influences.
- Direct impact and excessive vibration.

ATTENTION

Precautions for Electrostatic

- Excessive static electricity can be generated in dry conditions, so please make sure to discharge electrostatic with other materials like grounded metal bars before contacting unit

ATTENTION

Cleaning Unit

- Do not use thinners, which can damage or degrade PCB circuit board.

Compatibility of Pulse I/O unit to previous High-speed counter unit (1CH or 2H)

- Not compatible in terms of either hardware or software.
- Ladder program is also not compatible.

Comparison between previous High-speed counter unit (1CH or 2CH) and Pulse I/O unit

Comparison item		High-speed counter unit		Pulse I/O unit
		NX700 (NX-HSC1) N700 (CPL7620A) NX70 (NX70-HSC1)	NX700 (NX-HSC2) N700 (CPL7621) NX70 (NX70-HSC2)	NX700 (NX-PULSE4) NX70 (NX70-PULSE4)
High-speed counter	Number of channels	1CH	2CH	4CH
	Highest counting speed	Max. 100 KHz		Max. 200 KHz
	Counting range	24bit signed (Binary format) (-16,777,216 to +16,777,215)		32bit signed (Binary format) (-2,147,483,648 to +2,147,483,647)
	Min. input pulse width	5us		2.5us
	Comparison output	2 points, (C=P, C>P)	4 points, (C=P, C>P) x 2	8 points, random designation for 8 target values
Input time constant		None		4 μs, 8 μs, 16 μs, 32 μs (Setting for 2 input units)
Interrupt function		None		Max. 8 points per 1 unit. Interrupt program enabled in any of the following situations • Coincidence with high-speed counter target value • External input
Pulse output function		None		4CH, 100 KHz
PWM function		None		4CH, 30 KHz

NOTE Pluse output unit can be used for only the following CPU modules (models).
NX700 CPU Module: NX-CPU750A, NX-CPU750B, NX-CPU750C, NX-CPU750D
NX70 CPU Module: NX70-CPU750

Reference Manuals

NX70 System Manual

Included in the package box of NX70 CPU module (NX70-CPU750).

NX700 System Manual

Included in the package box of NX700 CPU module (NX-CPU750A, CPU750B, CPU750C, and CPU750D).

Programming Manual II (For N700a, N700H, NX700 PLC)

Included in the package box of NX70 CPU module (NX70-CPU750), N700H PLC and NX700 CPU module (NX-CPU750A, CPU750B, CPU750C, CPU750D).

WinFPST Software User Manual

For WinFPST S/W user manual, refer to HELP section of WinFPST S/W screen, or contact your local distributor.

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Pulse I/O Unit Specifications

Performance Specifications List

General Specifications

Item		Specifications
Temperature	Operating	0 °C to +55 °C (32 °F to 131 °F)
	Storage	-25 °C to +70 °C (-13 °F to 158 °F)
Humidity	Operating	30 to 85% RH (Non-condensing)
	Storage	30 to 85% RH (Non-condensing)
Withstand voltage		500V ac for 1 minute, between each pin<-> groundings of external connectors (Except F and E terminals) (F and E terminals: connector shield cables)
Insulation resistance		100 MΩ or more at 500 mega V dc between each pin <-> groundings of external connectors (But except F and E terminals) (F and E terminals: connector shield cables)
Vibration immunity		10 to 55 Hz, 1 cycle/minute: double amplitude of 0.75mm, 10 minutes on 3 axis (X, Y, Z)
Shock immunity		Peak acceleration and duration 98 m/s^2 or more, 4 times for each X, Y, Z direction
Noise immunity		1500Vp-p with 50ns to 1 μs pulse width (generated by noise simulator)
Ambience		No corrosive gas, no excessive dust

I/O Specifications

Common Specifications

Item	Pulse I/O unit (NX-PULSE4, NX70-PULSE4)
Occupied I/O points	Input 32 points, output 32 points (32SX, 32SY)
Internal Current Consumption	500 mA or less (DC 5V)
Operation Indicator	32-point LED (Lit when ON)
External connection method	Connector (One MIL standard 40P connector)
Weight	Approx. 130g

Input Specifications

Item			Pulse I/O unit (NX-PULSE4, NX70-PULSE4)
Input	Isolation method		Photocoupler
	Rated input voltage		24V DC
	Rated input current		Approx. 7.5 mA (at 24V DC)
	Input impedance:		Approx. 3.2 KΩ
	Use voltage range		20.4V DC to 26.4V DC
	Min. ON voltage/current		19.2V DC/6 mA
	Max. OFF voltage/current		5.0V DC/1.5 mA
	Response time * 1	OFF →ON	1 μs or less
		ON →OFF	2 μs or less
	Input time constant setting		N/A, 4 μs, 8 μs, 16 μs, 32 μs (2 input unit setting)
	Common method		16 points/Common (+Common)
Counter	Number of counter channels		4 CH
	Counting range		32-bit signed (-2,147,483,648 to +2,147,483,647)
	Max. counting speed *1		200 kHz
	Input mode		3 modes (Direction control, individual input, phase input)
	Min. input pulse width *1		2.5 μs
	Others		Comparison output 8 points, multiplication (1, 2, 4)
Interrupt	Interrupt points *2		N/A, 1 point/unit, 8 points/unit
	Interrupt delay		160 μs or less (NX-CPU750A, CPU750B, NX70-CPU750) 50 μs or less (NX-CPU750C, CPU750D)

*1. This value applies when input time constant (filter) is set to N/A.

*2. When using interrupts with a 1 point/unit setting, one of the interrupt programs (INT16 to INT 23) from the external input terminal (NX700: B1(X8), NX70: Interrupt program from **[I]** B1(X8) or from comparison 0 (one among INT16 to INT23) is booted.

Output Specifications

Item			Pulse I/O unit (NX-PULSE4, NX70-PULSE4)
Output	Isolation method		Photocoupler
	Rated load voltage		5 to 24V DC
	Rated load voltage range		4.75V DC to 26.4V DC
	Max. load current		NX700: 0.1A (A11 to A18, B11 to B14 terminals), 0.8A (B15 to B18 terminals) NX70: 0.1A ([II]A1 to A8, [II]B1 to B4 terminal), 0.8A ([II]B5 to B8 terminal)
	OFF state leakage current		1 μA or less
	Max. ON state voltage drop		0.5V or less
	Response time *1	OFF →ON	1 μs or less
		ON →OFF	1 μs or less
	Surge absorber		Zener diode
	Common method		16 points/COMMON
	External power supply	Voltage	20.4V DC to 26.4V DC
		Current	90 mA (for 24V DC)
Counter	Compare output		NX700: 8 points (A11 to A18 terminal) NX70: 8 points ([II] A1 to A8 terminal)
Pulse Output	Channel		NX700: 4CH (B11 to B18 terminal) NX70: 4CH ([II]B1 to B8 terminal)
	Min. output frequency *1		100 kHz
	Output mode		2 modes (direction control, individual output)
PWM Output	Number of output points		NX700: 4CH (B15 to B18 terminal) NX70: 4CH ([II]B5 to B8 terminal)
	Max. load current		0.8A
	Cycle *1		1 Hz to 30 kHz
	Duty *1		0 to 100% (1% unit)

*1 Max. load current, resistance load, and output waveform can be distorted depending on load current or type of load.

Function Specifications

Functions	Item	Pulse I/O unit (NX-PULSE4, NX70-PULSE4)
Input, Output	Occupied I/O points	32 In/32 Out
	External point	16 In/16 Out
Interrupt	Point	N/A, 1 point/unit, 8 points/unit
	Mode	1) No-interrupt unit 2) High-performance unit generating interrupts 3) Interrupt unit (configured by mode setting switch)
Counter	Number of channels	4CH
	Counting range	32-bit signed (-2,147,483,648 to +2,147,483,647)
	Counting speed	200 kHz *1
	Input mode	Direction control, individual input, phase input
	Special functions	Multiplication (1, 2, 4)
Comparison output	Point	Max. 8 points
Input time constant	Point	16 points (2-point unit)
	Constant	4, 8, 16, 32 μs
Pulse output	Number of channels	4CH *2
	Cycle	1 Hz to 100 kHz (Set unit 1 Hz)
	Output mode	Direction control, individual output
PWM output	Number of channels	4CH *2
	Output current	Max. 0.8A/1CH
	Duty	0 to 100% (Set unit 1%)
	Cycle	1 Hz - 30 kHz (Set unit 1 Hz)

*1 This value applies when input time constant (filter) is set to N/A.

*2 Pulse output and PWM output share a common CH.
When using combined functions, refer to the table below to select functions per each CH.

Combination	Using CH			
	CH0	CH1	CH2	CH3
1	PWM	PWM	PWM	PWM
2	PLS	PWM	PWM	PWM
3	PLS	PLS	PWM	PWM
4	PLS	PLS	PLS	PWM
5	PLS	PLS	PLS	PLS

I/O Contact Points

NX700 Pulse I/O unit (NX-PULSE4)

Input Contacts

NX700 Pulse I/O unit (NX-PULSE4)

	External Terminal	Functions					
		Input	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	A1	X0	-	CH0 IN-A	-	-	-
	A2	X1	-	CH0 IN-B	-	-	-
	A3	X2	-	CH0 Clear	-	-	-
	A4	X3	-	CH0 Mask	-	-	-
	A5	X4	-	CH1 IN-A	-	-	-
	A6	X5	-	CH1 IN-B	-	-	-
	A7	X6	-	CH1 Clear	-	-	-
	A8	X7	-	CH1 Mask	-	-	-
	B1	X8	Interrupt INT0	CH2 IN-A	-	-	-
	B2	X9	Interrupt INT1	CH2 IN-B	-	-	-
	B3	XA	Interrupt INT2	CH2 Clear	-	-	-
	B4	XB	Interrupt INT3	CH2 Mask	-	-	-
	B5	XC	Interrupt INT4	CH3 IN-A	-	-	-
	B6	XD	Interrupt INT5	CH3 IN-B	-	-	-
	B7	XE	Interrupt INT6	CH3 Clear	-	-	-
	B8	XF	Interrupt INT7	CH3 Mask	-	-	-
Unit Internal I/O	-	X10	-	-	Comparison CMP0	-	-
	-	X11	-	-	Comparison CMP1	-	-
	-	X12	-	-	Comparison CMP2	-	-
	-	X13	-	-	Comparison CMP3	-	-
	-	X14	-	-	Comparison CMP4	-	-
	-	X15	-	-	Comparison CMP5	-	-
	-	X16	-	-	Comparison CMP6	-	-
	-	X17	-	-	Comparison CMP7	-	-
	-	X18	-	-	-	PLS0 A	-
	-	X19	-	-	-	PLS0 B	-
	-	X1A	-	-	-	PLS1 A	-
	-	X1B	-	-	-	PLS1 B	-
	-	X1C	-	-	-	PLS2 A	PWM0
	-	X1D	-	-	-	PLS2 B	PWM1
	-	X1E	-	-	-	PLS3 A	PWM2
	-	X1F	-	-	-	PLS3 B	PWM3

- : No input allocation.

The I/O number allocations above are applied when NX700 PLC Pulse I/O unit (4CH) is installed in slot 0.
I/O number can differ depending on the installation slot.

Output contact

NX700 Pulse I/O unit (NX-PULSE4)

	External Terminal	Functions					
		Output	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	A11	Y20	-	-	[Comparison CMP0]	PLS0 direction	-
	A12	Y21	-	-	[Comparison CMP1]	PLS1 direction	-
	A13	Y22	-	-	[Comparison CMP2]	PLS2 direction	-
	A14	Y23	-	-	[Comparison CMP3]	PLS3 direction	-
	A15	Y24	-	-	[Comparison CMP4]	-	-
	A16	Y25	-	-	[Comparison CMP5]	-	-
	A17	Y26	-	-	[Comparison CMP6]	-	-
	A18	Y27	-	-	[Comparison CMP7]	-	-
	B11	Y28	-	-	-	[PLS0 A]	-
	B12	Y29	-	-	-	[PLS0 B]	-
	B13	Y2A	-	-	-	[PLS1 A]	-
	B14	Y2B	-	-	-	[PLS1 B]	-
	B15	Y2C	-	-	-	[PLS2 A]	[PWM0]
	B16	Y2D	-	-	-	[PLS2 B]	[PWM1]
	B17	Y2E	-	-	-	[PLS3 A]	[PWM2]
	B18	Y2F	-	-	-	[PLS3 B]	[PWM3]
Unit Internal I/O	-	Y30	-	CH0 Soft Clear	-	-	-
	-	Y31	-	CH0 Soft Mask	-	-	-
	-	Y32	-	CH1 Soft Clear	-	-	-
	-	Y33	-	CH1 Soft Mask	-	-	-
	-	Y34	-	CH2 Soft Clear	-	-	-
	-	Y35	-	CH2 Soft Mask	-	-	-
	-	Y36	-	CH3 Soft Clear	-	-	-
	-	Y37	-	CH3 Soft Mask	-	-	-
	-	Y38	-	-	-	PLS0 enabled	PWM0 enabled
	-	Y39	-	-	-	PLS1 enabled	PWM1 enabled
	-	Y3A	-	-	-	PLS2 enabled	PWM2 enabled
	-	Y3B	-	-	-	PLS3 enabled	PWM3 enabled
	-	Y3C	-	-	-	PLS0 start	PWM0 start
	-	Y3D	-	-	-	PLS1 start	PWM1 start
	-	Y3E	-	-	-	PLS2 start	PWM2 start
	-	Y3F	-	-	-	PLS3 start	PWM3 start

- : No output allocation

[ ] : Indicate the connector pins to which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

The I/O number allocations above are applied when NX700 PLC Pulse output unit (4CH) is installed in slot 0. I/O number can differ depending on the installation slot.

NX70 Pulse I/O Unit (NX70-PULSE4)

Input contact

NX70 Pulse I/O unit (NX70-PULSE4)

	External Terminal		Functions					
			Input	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	[I]	A1	X0	-	CH0 IN-A	-	-	-
		A2	X1	-	CH0 IN-B	-	-	-
		A3	X2	-	CH0 Clear	-	-	-
		A4	X3	-	CH0 Mask	-	-	-
		A5	X4	-	CH1 IN-A	-	-	-
		A6	X5	-	CH1 IN-B	-	-	-
		A7	X6	-	CH1 Clear	-	-	-
		A8	X7	-	CH1 Mask	-	-	-
		B1	X8	Interrupt INT0	CH2 IN-A	-	-	-
		B2	X9	Interrupt INT1	CH2 IN-B	-	-	-
		B3	XA	Interrupt INT2	CH2 Clear	-	-	-
		B4	XB	Interrupt INT3	CH2 Mask	-	-	-
		B5	XC	Interrupt INT4	CH3 IN-A	-	-	-
		B6	XD	Interrupt INT5	CH3 IN-B	-	-	-
		B7	XE	Interrupt INT6	CH3 Clear	-	-	-
		B8	XF	Interrupt INT7	CH3 Mask	-	-	-
Unit Internal I/O		-	X10	-	-	Comparison CMP0	-	-
		-	X11	-	-	Comparison CMP1	-	-
		-	X12	-	-	Comparison CMP2	-	-
		-	X13	-	-	Comparison CMP3	-	-
		-	X14	-	-	Comparison CMP4	-	-
		-	X15	-	-	Comparison CMP5	-	-
		-	X16	-	-	Comparison CMP6	-	-
		-	X17	-	-	Comparison CMP7	-	-
		-	X18	-	-	-	PLS0 A	-
		-	X19	-	-	-	PLS0 B	-
		-	X1A	-	-	-	PLS1 A	-
		-	X1B	-	-	-	PLS1 B	-
		-	X1C	-	-	-	PLS2 A	PWM0
		-	X1D	-	-	-	PLS2 B	PWM1
		-	X1E	-	-	-	PLS3 A	PWM2
		-	X1F	-	-	-	PLS3 B	PWM3

- : No input allocation.

The I/O number allocations above are applied when NX70 PLC Pulse output unit (4CH) is installed in slot 0. I/O number can differ depending on the installation slot.

Output contact NX70 Pulse I/O unit (NX70-PULSE4)

	External Terminal		Functions					
			Output	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	[II]	A1	Y20	-	-	[Comparison CMP0]	PLS0 direction	-
		A2	Y21	-	-	[Comparison CMP1]	PLS1 direction	-
		A3	Y22	-	-	[Comparison CMP2]	PLS2 direction	-
		A4	Y23	-	-	[Comparison CMP3]	PLS3 direction	-
		A5	Y24	-	-	[Comparison CMP4]	-	-
		A6	Y25	-	-	[Comparison CMP5]	-	-
		A7	Y26	-	-	[Comparison CMP6]	-	-
		A8	Y27	-	-	[Comparison CMP7]	-	-
		B1	Y28	-	-	-	[PLS0 A]	-
		B2	Y29	-	-	-	[PLS0 B]	-
		B3	Y2A	-	-	-	[PLS1 A]	-
		B4	Y2B	-	-	-	[PLS1 B]	-
		B5	Y2C	-	-	-	[PLS2 A]	[PWM0]
		B6	Y2D	-	-	-	[PLS2 B]	[PWM1]
		B7	Y2E	-	-	-	[PLS3 A]	[PWM2]
		B8	Y2F	-	-	-	[PLS3 B]	[PWM3]
Unit Internal I/O		-	Y30	-	CH0 Soft Clear	-	-	-
		-	Y31	-	CH0 Soft Mask	-	-	-
		-	Y32	-	CH1 Soft Clear	-	-	-
		-	Y33	-	CH1 Soft Mask	-	-	-
		-	Y34	-	CH2 Soft Clear	-	-	-
		-	Y35	-	CH2 Soft Mask	-	-	-
		-	Y36	-	CH3 Soft Clear	-	-	-
		-	Y37	-	CH3 Soft Mask	-	-	-
		-	Y38	-		-	PLS0 enabled	PWM0 enabled
		-	Y39	-	-	-	PLS1 enabled	PWM1 enabled
		-	Y3A	-	-	-	PLS2 enabled	PWM2 enabled
		-	Y3B	-	-	-	PLS3 enabled	PWM3 enabled
		-	Y3C	-	-	-	PLS0 start	PWM0 start
		-	Y3D	-	-	-	PLS1 start	PWM1 start
		-	Y3E	-	-	-	PLS2 start	PWM2 start
		-	Y3F	-	-	-	PLS3 start	PWM3 start

- marks: No output allocation

[ ] marks: Indicate the connector pins to which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

The I/O number allocations above are applied when NX70 PLC Pulse I/O unit (4CH) is installed in slot 0. I/O number can differ depending on the installation slot.

Shared Memory Areas

NX700, NX70 PLC Pulse I/O unit (4CH) shared memory map.

Shared Memory Map

Address	Access unit [word]	Functions	R/W	Event
100h, 101h	2W	Counter setting	R/W	Counter functions setting
102h, 103h	2W	Reserved		
104h, 105h	2W	Comparison output setting		Comparison output setting
106h, 107h	2W	Reserved		
108h, 109h	2W	Counter <CH0> Current value	R/W	CH0 Counter Current value (signed 32-bit)
10Ah, 10Bh	2W	Counter <CH1> Current value	R/W	CH1 Counter Current value (signed 32-bit)
10Ch, 10Dh	2W	Counter <CH2> Current value	R/W	CH2 Counter Current value (signed 32-bit)
10Eh, 10Fh	2W	Counter <CH3> Current value	R/W	CH2 Counter Current value (signed 32-bit)
110h to 11Fh	2W	Reserved		
120h, 121h	2W	Comparison output Set value MEM0	R/W	Comparison with counter current value (signed 32-bit)
122h, 123h	2W	Comparison output Set value MEM1	R/W	Comparison with counter current value (signed 32-bit)
124h, 125h	2W	Comparison output Set value MEM2	R/W	Comparison with counter current value (signed 32-bit)
126h, 127h	2W	Comparison output Set value MEM3	R/W	Comparison with counter current value (signed 32-bit)
128h, 129h	2W	Comparison output Set value MEM4	R/W	Comparison with counter current value (signed 32-bit)
12Ah, 12Bh	2W	Comparison output Set value MEM5	R/W	Comparison with counter current value (signed 32-bit)
12Ch, 12Dh	2W	Comparison output Set value MEM6	R/W	Comparison with counter current value (signed 32-bit)
12Eh, 12Fh	2W	Comparison output Set value MEM7	R/W	Comparison with counter current value (signed 32-bit)
130h to 137h	2W	Reserved		
138h, 139h	2W	Interrupt Setting	R/W	Interrupt Input Point Setting
13Ah, 13Bh	2W	Reserved		
13Ch, 13Dh	2W	Input time constant setting	R/W	Input time constant setting for input X0 to XF
13Eh, 13Fh	2W	Reserved		
140h to 141h	2W	PLS/PWM Setting	R/W	Pulse output form setting
142h, 143h	2W	PLS/PWM flag	R	Pulse output form monitor
144h to 147h	2W	Reserved		
148h, 149h	2W	PLS0/PWM0 frequency setting	R/W	Output frequency setting
14Ah, 14Bh	2W	PLS0/PWM1 frequency setting	R/W	Output frequency setting
14Ch, 14Dh	2W	PLS0/PWM2 frequency setting	R/W	Output frequency setting
14Eh, 14Fh	2W	PLS0/PWM3 frequency setting	R/W	Output frequency setting
150h to 157h	2W	Reserved		
158h, 159h	2W	PWM0 Duty Setting	R/W	PWM Duty Setting
15Ah, 15Bh	2W	PWM1 Duty setting	R/W	PWM Duty Setting
15Ch, 15Dh	2W	PWM2 Duty setting	R/W	PWM Duty Setting
15Eh, 15Fh	2W	PWM3 Duty setting	R/W	PWM Duty Setting

NOTE R/W: Read and write. R: Read only.

Shared Memory Area Description

Below is a description of NX700, NX70 PLC Pulse I/O (4CH) unit shared memory.

100h, 101h	Counter functions setting

Address: 100h 101h

Setting the operation mode for each counter CH with shared memory settings. Set the counter functions mode as shown in the table below.

b31~ b28	b27~ b24	b23~ b20	b19~ b16	b15~ b12	b11~ b8	b7~ b4	b3~ b0

Counter setting

- b0 → Counter CH0 setting (used/unused)
- b4 → Counter CH0 setting (input mode)
- b8 → Counter CH1 setting (used/unused)
- b12 → Counter CH1 setting (input mode)
- b16 → Counter CH2 setting (used/unused)
- b20 → Counter CH2 setting (input mode)
- b24 → Counter CH3 setting (used/unused)
- b28 → Counter CH3 setting (input mode)

Setting (Input Mode) Effective only for terminal input

Set value (HEX)	Functions	
	Terminal input mode	Multiplication
0	Direction control *3	N/A
1	Individual input	
2	Phase input	1 multiplication
3		2 multiplications
4		4 multiplications
5	Invalid *2	
6		
7		
8		
9		
A		
B		
C		
D		
E		
F		

Setting (Function)

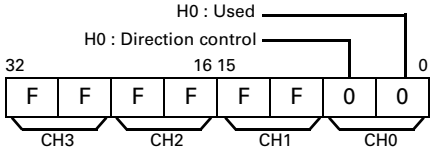
Set value (HEX)	Functions
	Counter
0	Used (Terminal input)
1	
2	Used (Internal connection) *1
3	
4	Invalid *2
5	
6	
7	
8	
9	
A	
B	
C	
D	
E	
F	Unused *3

*1: Used when counting the number of output pulses, with internal connection of pulse output and PWM output.

*2: Do not use this setting.

*3: Initial values on power input are set as direction control for input mode and unused for function setting.

Shared Memory Area Setting Example

Setting item	Shared memory address	Setting example	Setting range
Counter	100h to 101h	For each channel (CH0 to CH3), 8 bits are allocated. 	Setting range for each channel H00 : Direction control H10 : Individual input H20 : Phase input (1 multiplication) H30 : Phase input (2 multiplications) H40 : Phase input (4 multiplications) HFF : Unused

102h, 103h	Reserved
104h, 105h	Comparison output point setting

Select the counter CH and output logic to be compared with comparison output set value.

Address: 104h, 105h

b31~ b28	b27~ b24	b23~ b20	b19~ b16	b15~ b12	b11~ b8	b7~ b4	b3~ b0

Comparison output point setting

- b3~b0 → Comparison output point CMP0 setting
- b7~b4 → Comparison output point CMP1 setting
- b11~b8 → Comparison output point CMP2 setting
- b15~b12 → Comparison output point CMP3 setting
- b19~b16 → Comparison output point CMP4 setting
- b23~b20 → Comparison output point CMP5 setting
- b27~b24 → Comparison output point CMP6 setting
- b31~b28 → Comparison output point CMP7 setting

Comparison Output Setting

Set value (HEX)	Comparison output functions	Functions	
		Output logic	Counter CH to be compared
0	Used	ON when current value < set value	CH0
1			CH1
2			CH2
3			CH3
4		ON when current value ≥ set value	CH0
5			CH1
6			CH2
7			CH3
8	Invalid *1	Invalid *1	
9			
A			
B			
C			
D			
E			
F	Unused *2	-	

*1: Do not use this setting.

*2: Initial value on power input is set to unused.

Shared Memory Area Setting Example

Setting item	Shared memory address	Setting example	Setting range
Comparison output setting	104h to 105h	For comparison output 8 points (CMP0 to CMP7), 4 bits are allocated for each. H0: Negative logic output counter CH0 32 … 16 15 … 0 F F F F F F F 0 CMP7 CMP6 CMP5 CMP4 CMP3 CMP2 CMP1 CMP0	Setting range for each channel ON when current value < set value 1) H0 : CH0 2) H1 : CH1 3) H2 : CH2 4) H3 : CH3 ON when current value ≥ set value 1) H4 : CH0 2) H5 : CH1 3) H6 : CH2 4) H7 : CH3 5) HF : Unused

106h, 107h	Reserved

108h to 10Fh	Counter <CHx> Current value

- Current value of each counter is stored in shared memory as described below.
- Use F150 and P150 instructions (reading data from high-performance units) to read the current value by 2 word units.

	Address	
Counter CH0 Current value	Address: 108h 109h	K-2,147,483,648 to K+2,147,483,647
Counter CH1 Current value	Address: 10Ah 10Bh	K-2,147,483,648 to K+2,147,483,647
Counter CH2 Current value	Address: 10Ch 10Dh	K-2,147,483,648 to K+2,147,483,647
Counter CH3 Current value	Address: 10Eh 10Fh	K-2,147,483,648 to K+2,147,483,647

110h to 11Fh	Reserved

120h to 12Fh	Comparison output set value

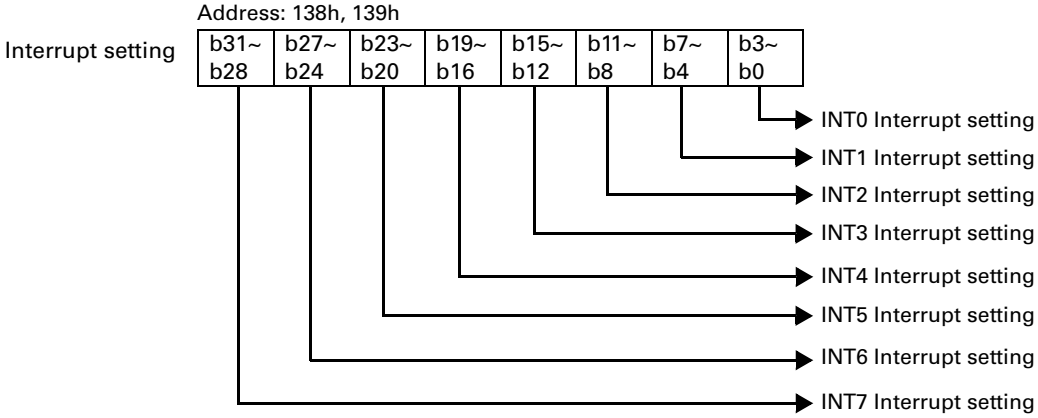
- Set the comparison output set value to be compared with counter current value.

		Address	
Comparison output Set value (for CMP0)	MEM0	Address: 120h 121h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP1)	MEM1	Address: 122h 123h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP2)	MEM2	Address: 124h 125h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP3)	MEM3	Address: 126h 127h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP4)	MEM4	Address: 128h 129h	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP5)	MEM5	Address: 12Ah 12Bh	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP6)	MEM6	Address: 12Ch 12Dh	K-2,147,483,648 to K+2,147,483,647
Comparison output Set value (for CMP7)	MEM7	Address: 12Eh 12Fh	K-2,147,483,648 to K+2,147,483,647

130h to 137h	Reserved

138h, 139h	Interrupt Setting

➡ Set interrupt function mode in reference to the table below.



Set value (HEX)	Functions		
	Interrupt Function	Connection point	Interrupt condition
0	Used	Comparison output function *1 (CMP0 to CMP7)	Coincidence output
1			
2		Input terminal (X8 to XF)	off →on
3			on →off *2
4	Invalid *3	Invalid *3	Invalid *3
5			
6			
7			
8			
9			
A			
B			
C			
D			
E			
F	Unused *4	-	-

*1: Each of INT0 to INT7 corresponds to each of CMP0 to CMP7.

<Ex> When Set Value 1 is selected for INT0 interrupt setting, interrupt generates on coincidence output (EQ0) at CMP0.

*2: When you select this setting, make sure you run interrupt clear after setting.

*3: Do not use this setting.

*4: Initial value on power input is set to unused.

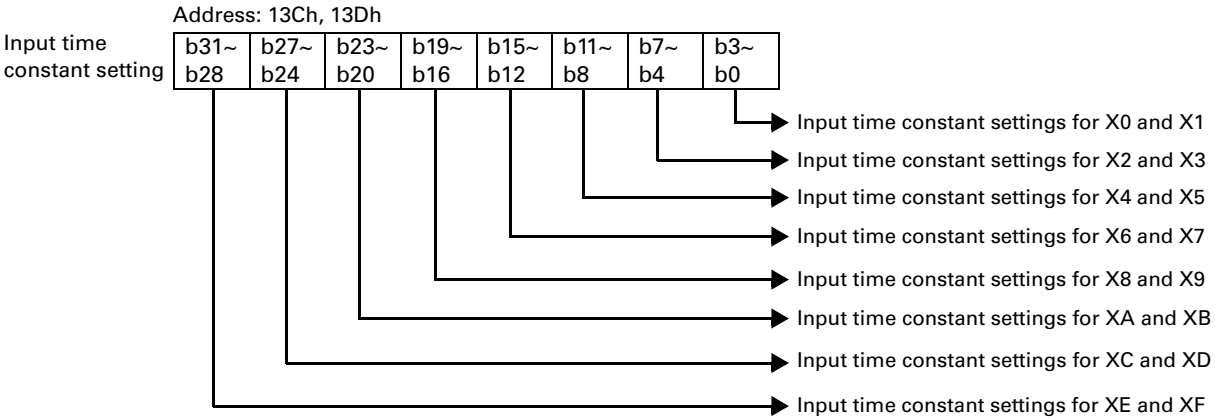
Shared Memory Area Setting Example

Setting item	Shared memory address	Setting example	Setting range
Interrupt	138h to 139h	For interrupt programs (INT0 to INT7), 4 bits are allocated for each program. H1 : High-speed counter coincidence output 32 16 15 0 F F F F F F F 1 INT7 INT6 INT5 INT4 INT3 INT2 INT1 INT0	Interrupt setting range H1 : High-speed counter coincidence output H2 : External input off →on H3 : External input on →off HF : Unused

13Ah, 13Bh	Reserved

13Ch, 13Dh	Input time constant setting

- Set the input time constant for 8 external input terminal groups with shared memory settings.
- Input time constant is set for external input terminal, so function allocations for each of input X0 to XF settings are also valid. (Counter input, interrupt input)


Address: 13Ch, 13Dh
Input time constant setting
b31~ b28
b27~ b24
b23~ b20
b19~ b16
b15~ b12
b11~ b8
b7~ b4
b3~ b0
Input time constant settings for X0 and X1
Input time constant settings for X2 and X3
Input time constant settings for X4 and X5
Input time constant settings for X6 and X7
Input time constant settings for X8 and X9
Input time constant settings for XA and XB
Input time constant settings for XC and XD
Input time constant settings for XE and XF

Input Time Constant Setting

Set value (HEX)	Functions	
	Input time constant	Effective pulse width
0	Used	4 μs
1		8 μs
2		16 μs
3		32 μs
4	Invalid *1	Invalid *1
5		
6		
7		
8		
9		
A		
B		
C		
D		
E		
F	Unused *2	-

*1: Do not use this setting.

*2: Initial value on power input is set to unused.

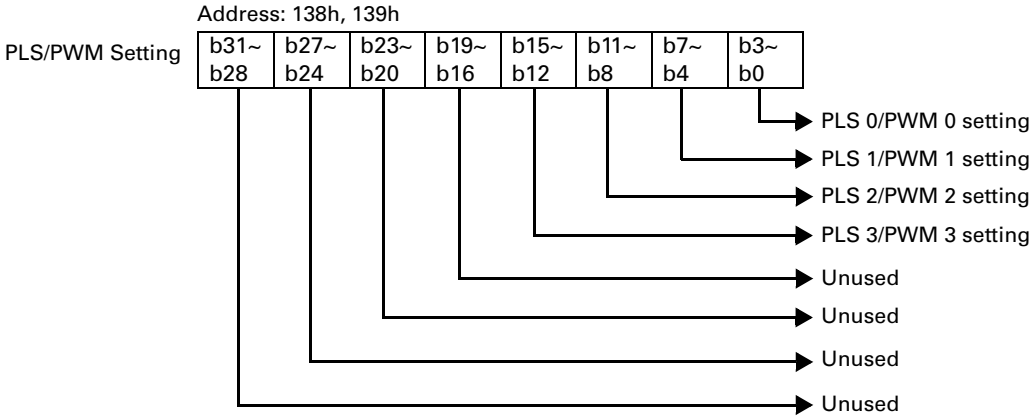
Shared Memory Area Setting Example

Setting item	Shared memory address	Setting example	Setting range
Input time constant	13Ch to 13Dh	For inputs (X0, X1 to XE, XF), 4 bits are allocated for each input. H2 : 16 μs 32 16 15 0 F F F F F F F 2 XF XD XB X9 X7 X5 X3 X1 XE XC XA X8 X6 X4 X2 X0	Input time constant setting range H0 : 4 μs H1 : 8 μs H2 : 16 μs H2 : 32 μs HF : Unused

13Eh, 13Fh	Reserved

140h, 141h	PLS/PWM Setting

Set PWM output form by shared memory PLS/PWM settings.



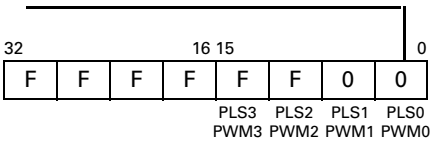
Pulse output setting (PWM, PLS)

Set value (HEX)	Functions		
	Pulse function	Data change timing	Output mode
0	PWM	Refresh on edge rise of PLSx start signal	-
1		Edge rise of PLSx start signal, or comparison output	
2		Edge rise of PLSx start signal, or data refresh	
3		Reserved	
4	PLS	Refresh on edge rise of PLSx start signal	Direction control
5			Individual output
6		Edge rise of PLSx start signal, or comparison output	Direction control
7			Individual output
8		Edge rise of PLSx start signal, or data refresh	Direction control
9			Individual output
A	Invalid *1	Invalid *1	Invalid *1
B			
C			
D			
E			
F	Unused *2	-	-

*1: Do not use this setting.

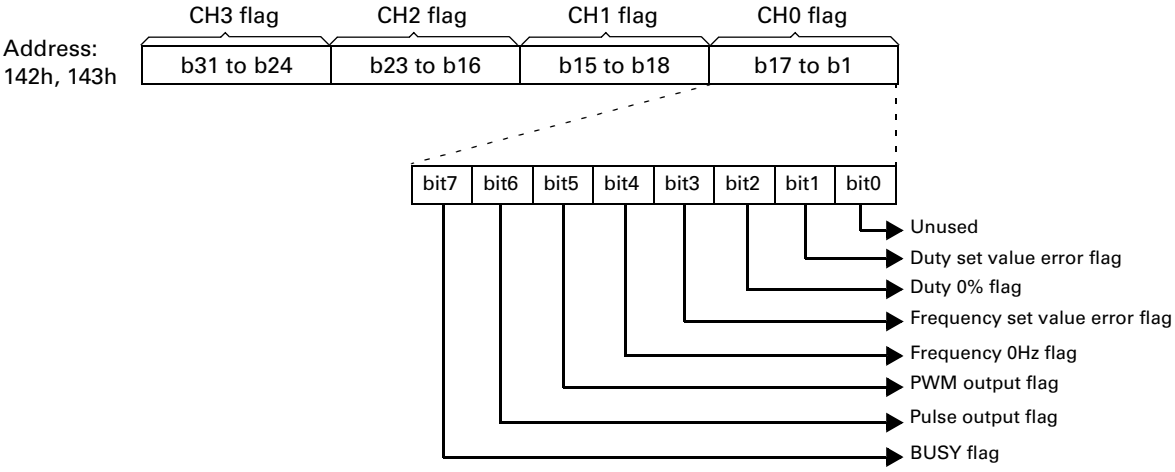
*2: Initial value on power input is set to unused.

Shared Memory Area Setting Example

Setting item	Shared memory address	Setting example	Setting range
PLS/ PWM setting	140h to 141h	For each output (PLS0, PWM0 to PLS3, PWM3) 4 bits are allocated. H4: Pulse output (direction control mode) Data refresh with rising edge of start signal  	PLS/PWM Setting range **PWM output** H00: Data change on rising edge of start H1: Data change on rising edge of start, or comparison output H2: Data change on rising edge of start, or data refresh **Pulse output (direction control mode)** H4: Data change on rising edge of start H6: Data change on rising edge of start, or comparison output H8: Data change on rising edge of start, or data refresh **Pulse output (individual output mode)** H5: Data change on rising edge of start H7: Data change on rising edge of start, or comparison output H9: Data change on rising edge of start, or data refresh HF: Unused

142h, 143h	PLS/PWM flag

Pulse output status can be monitored by reading the bit of this address.



Flag specifications

bit 7 ..... **BUSY flag**

This flag indicates pulse or PWM output.
1: Output 0: Output OFF

bit 6 ..... **Flag for pulse output setting**

Output when pulse output setting is configured.
1: Configured 0: Not configured

bit 5 ..... **Flag for PWM output setting**

Output when PWM output function is configured.
1: Configured 0: Not configured

bit 4 ..... **Flag for frequency 0Hz**

Output when frequency is set to 0Hz.
1: 0Hz Configured 0: Setting other than 0Hz

bit 3 ..... **Error flag for frequency settings**

Output when frequency setting is out of permitted range.
PLS output
1: Setting 131.072 kHz *1 0: Setting less than 131.072kHz
PWM output
1: Setting more than 32.768 kHz *1 0: Setting less than 32.768 kHz

*1: Upper limit for error detection is 1048.575 kHz. (1048.575 kHz = FFFFFh)
When setting exceeds the limit, the value based on the lower 20bit is applied.

bit 2 ..... **Flag for duty 0% setting.**

Output when duty is set to 0%.
1 : Setting 0% 0: Setting other than 0%

bit 1 ..... **Error flag for duty setting**

Output when duty setting exceeds 101%.
1: More than 101% 0: Less than 101%

Flag example

Item		Set value								
		BIN								HEX
		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0	
On power input		0	0	0	1	0	1	0	0	I4
Pulse output	Average	1	1	0	0	0	1	0	0	C4
	0 Hz setting	1	1	0	1	0	1	0	0	D5
	Error in frequency setting	1	1	0	0	1	1	0	0	DC
PWM output	Average	1	0	1	0	0	0	0	0	A0
	0 Hz setting	1	0	1	1	0	0	0	0	B0
	Error in frequency setting	1	0	1	0	1	0	0	0	A8
	Duty 0% setting	1	0	1	0	0	1	0	0	A4
	Error in Duty setting	1	0	1	0	0	0	1	0	A2

144h to 147h	Reserved

148h to 14Fh	PLSx/PWMx frequency setting

PLS0/PWM0 frequency setting	Address: 148h 149h For PWM: K1 to K30000
PLS1/PWM1 frequency setting	Address: 14Ah 14Bh For PM: K1 to K30000
PLS2/PWM2 frequency setting	Address: 14Ch 14Dh For PWM: K1 to K30000
PLS3/PWM3 frequency setting	Address: 14Eh 14Fh For PWM: K1 to K30000

150h to 157h	Reserved

158h to 15Fh	PWMx Duty setting

PWM0 Duty Setting	Address: 158h 159h K0 to K100
PWM1 Duty Setting	Address: 15Ah 15Bh K0 to K100
PWM2 Duty Setting	Address: 15Ch 15Dh K0 to K100
PWM3 Duty Setting	Address: 15Eh 15Fh K0 to K100

2

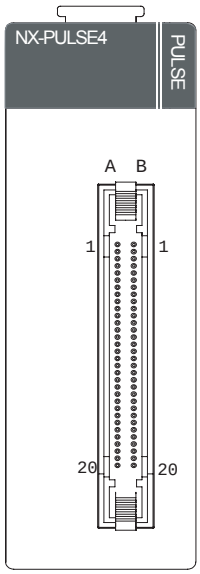
Pulse I/O Unit Functions

Unit Features and Functions

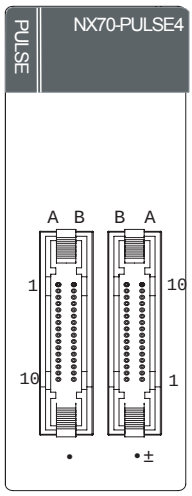
Unit Features

NX700 NX70 PLC Pulse I/O unit is a special unit that provides easy implementation of pulse output and high-speed counter functions. The main features of pulse I/O unit include the following.

Pulse I/O unit provides high-speed counter functions with various other functions as follows:



NX700 PLC
Pulse output unit
(NX-PULSE4)



NX70 PLC
Pulse output unit
(NX70-PULSE4)

It operates as mixed I/O unit.	General I/O Function (See *"Chapter 4"*)
Set the effective pulse width of input signal.	Input Time Constant Function (See *"Chapter 5"*)
Count pulse number.	Counter Function (See *"Chapter 6"*)
Compare pulse number and set value and output the results.	Comparison Output Function (See *"Chapter 7"*)
Generate interrupt signal.	Interrupt Function (See *"Chapter 8"*)
Pulse output.	Pulse Output Function (See *"Chapter 9"*)
PWM output.	PWM Output Function. (See *"Chapter 10"*)

Pulse output and PWM output are only available to pulse I/O unit. Be careful because this function is NOT available for High-performance High-speed counter unit (4CH).

System Configuration Without Losses

Unit I/O terminals that are not allocated to any function can be used for general I/O terminal, which enables a single high-speed counter unit to be used both for counter function and sensor input, providing system configuration without system resource loss.

Interrupt Function

Interrupt control for general external input, and support for interrupt control by counter and set value coincidence.

Easy location control with a single pulse I/O unit.

Pulse I/O unit provides pulse output function. Output pulse is feedback to unit, providing easy location control with a single unit.

Four 0.8A Outputs

Functions of Unit

- Each function can be operated by shared memory settings.
  But, interrupt mode setting is selected with mode setting switch on the bottom of the unit.
- The factory default is set to OFF (no interrupt functions) for switches, and the unit runs as a usual I/O unit on power input.

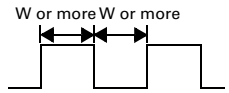
General I/O Functions

- Pulse I/O unit can be used as 32In/32Out mixed I/O unit with its default setting without mode setting switch or shared memory configuration.
  But, I/O is initially allocated for 16 points for each, actually it will be used as 16In/16Out mixed I/O unit.
- I/O allocation changes depending on unit installation slot.
  (EX) When unit is installed in slot 0, occupied I/O will be WX0 to WX1, WY2 to WY3, and the actual allocation for terminal will be WX0 and WY2.
- Function I/O will set as priority when using functions, but for areas without function allocation, they will be used for general I/O.

Input Time Constant Functions

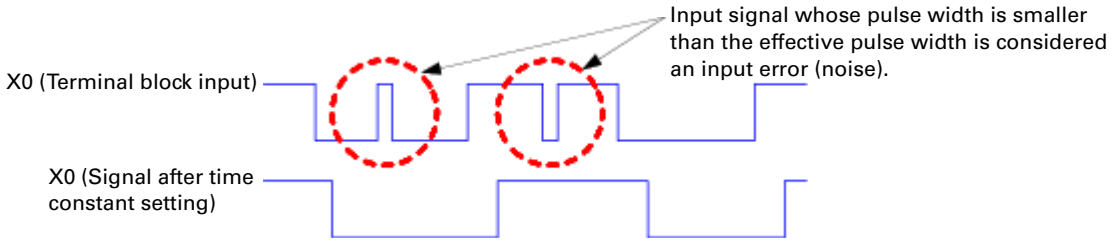
- Effective pulse width for input signals from I/O connector can be set by this function.
  Input signal whose pulse width is smaller than the effective pulse width is considered noise.
- Effective pulse width can be set by four constants, in two point units for I/O connector, as described below.

Effective Pulse Width (Wμs)	Max. count speed
No setting	200 kHz
4	125 kHz
8	62.5 kHz
16	31.2 kHz
32	15.6 kHz



Setting Unit	External input terminal	
	NX700 Pulse output unit	NX70 Pulse output unit
Group 1	A1, A2 (Input allocation X0, X1)	[I] A1, A2 (Input allocation X0, X1)
Group 2	A3, A4 (Input allocation X2, X3)	[I] A3, A4 (Input allocation X2, X3)
Group 3	A5, A6 (Input allocation X4, X5)	[I] A5, A6 (Input allocation X4, X5)
Group 4	A7, A8 (Input allocation X6, X7)	[I] A7, A8 (Input allocation X6, X7)
Group 5	B1, B2 (Input allocation X8, X9)	[I] B1, B2 (Input allocation X8, X9)
Group 6	B3, B4 (Input allocation XA, XB)	[I] B3, B4 (Input allocation XA, XB)
Group 7	B5, B6 (Input allocation XC, XD)	[I] B5, B6 (Input allocation XC, XD)
Group 8	B7, B8 (Input allocation XE, XF)	[I] B7, B8 (Input allocation XE, XF)

- Input time constant function prevents input errors caused by noise by setting the effective pulse width of input signals. See *"Chapter 5"* for detailed settings for input time constant.


Input signal whose pulse width is smaller than the effective pulse width is considered an input error (noise).
X0 (Terminal block input)
X0 (Signal after time constant setting)

ATTENTION Be careful because that the default is set to no time constant setting.

Interrupt Function

➡ The mode setting switch determines the function mode described below on power input.

Mode	Unit operation	Available interrupt points	Number of interrupt programs that can be set by the program	Interrupt input *3
A	No interrupt function unit	0	-	-
B	Interrupt function unit	8	Corresponding to INT0 to 7 or INT8 to 15 *1	I/O connector (X8 to XF) Comparison coincidence signal (EQ0 to EQ7) *2
C	Interrupt generation Special unit	1	Corresponding to INT16 to 23 *1	I/O Connector (X8) Comparison coincidence signal (EQ0) *2

*1: Corresponding interrupt number differs depending on the unit installation location.

*2: Internal signal for comparison function. Generated when counter current value and comparison value coincide.

*3: Input signal for interrupt generation is selectable. (I/O connector or comparison coincidence signal)

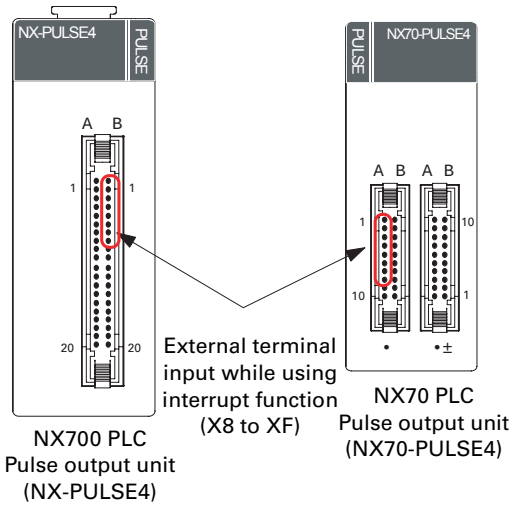
Example of ladder instruction and interrupt input signal corresponding

Mode B

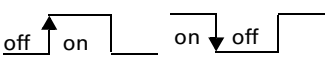
INT0 ←X8, or EQ0
INT1 ←X9, or EQ1
INT2 ←XA, or EQ2
INT3 ←XB, or EQ3
INT4 ←XC, or EQ4
INT5 ←X8, or EQ5
INT6 ←XD, or EQ6
INT7 ←XE, or EQ7

Mode C

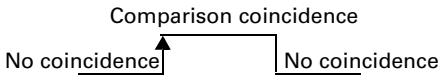
INT16 ←X8, or EQ0



Interrupt generates on edge input.



External terminal input



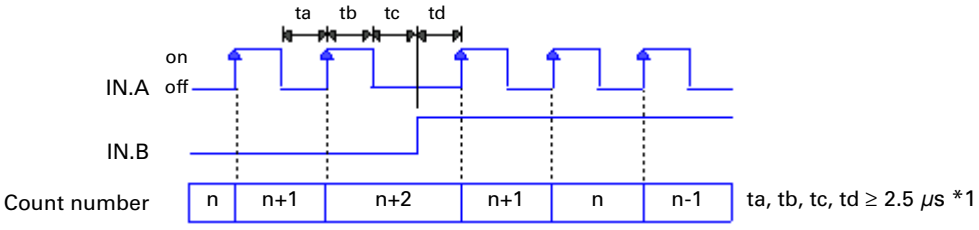
Comparison coincidence signal input

High-speed Counter Function

Pulse I/O unit has four high-speed counter channels. There are three input modes for counting. Input mode can be set for each CH.

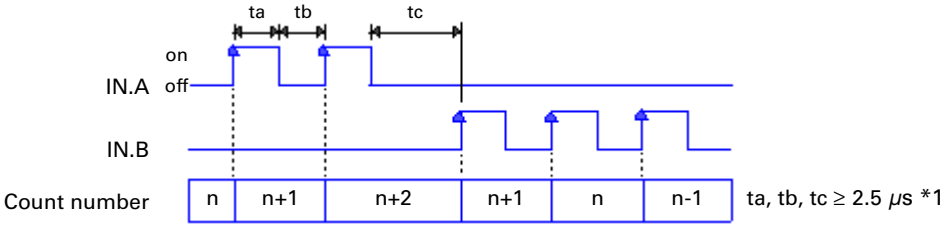
Direction control

Counter value changes with pulse string and direction signals.



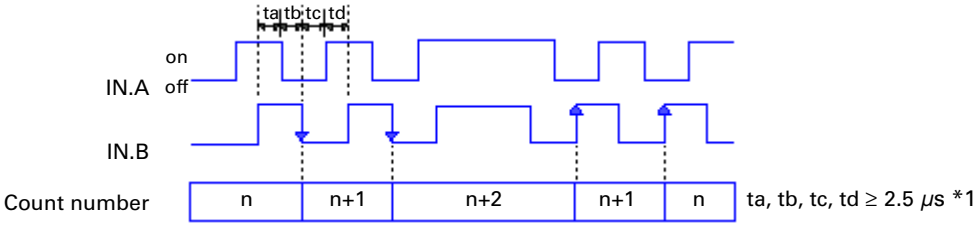
Individual input

Count value changes with each input signal at CW and CCW.



Phase differential

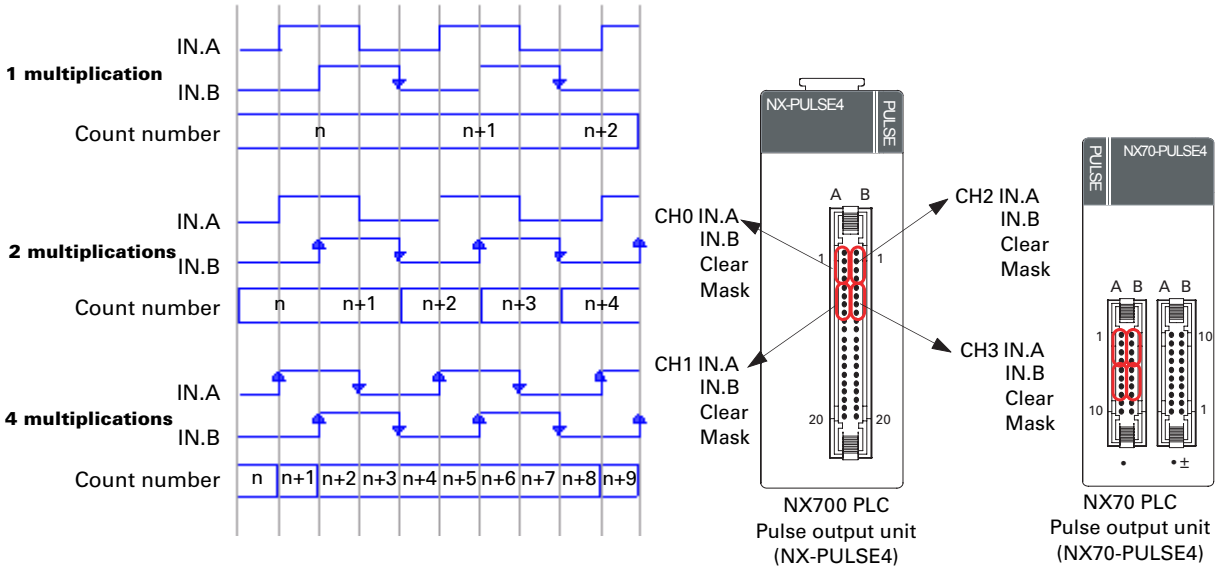
Count value changes with the phase differential input on encoder and others.



*1: Value for when input time constant (filter) is set to None.

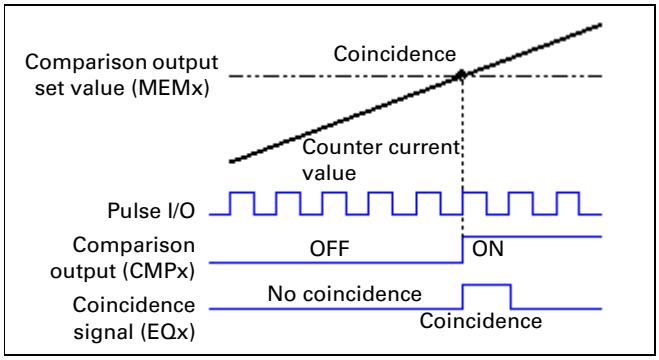
IMPORTANT About multiplication

There are three types of multiplication for phase differential input mode as following.

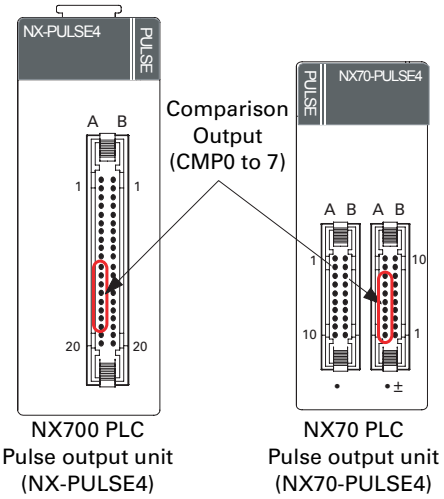


Comparison Output Function

- Pulse I/O unit has 8 points of comparison output.
  (CMP0 to CMP7)
- Counter current value and comparison set value are compared, and the comparison results are output.
  Comparison output set value is set by shared memory.
  (MEM0 to MEM7)
  (Counter current value) < (Comparison output set value) → Comparison output: OFF
  (Counter current value) ≥ (Comparison output set value) → Comparison output: ON

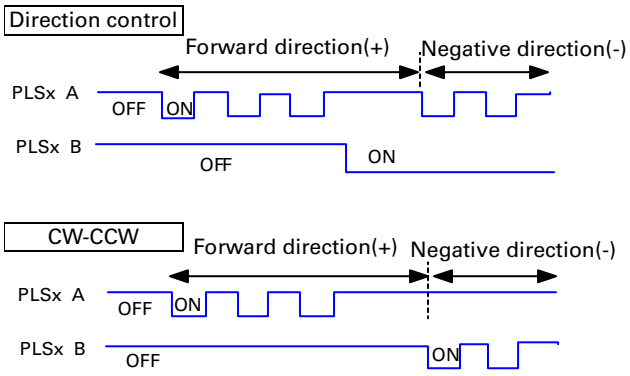


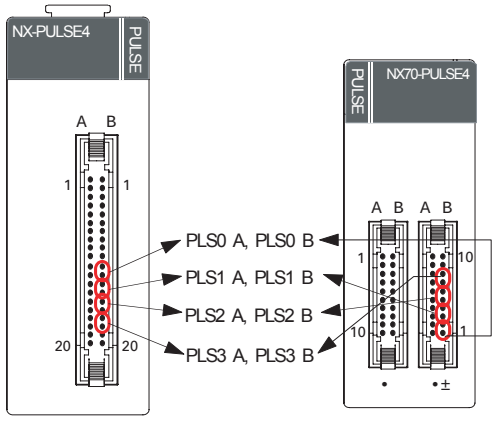
Comparison output ON/OFF can also be set as reverse operation.
EQx is an internal processing signal that is not sent outside.



Pulse Output Function

- Pulse I/O unit has 4CH for pulse output.
- Max. 100 kHz output and 2 modes of output form as shown below are available for pulse output function.
  Output frequency can be set by 1 Hz unit.
- Pulse output unit can be input to high-speed counter via internal connection, providing high-speed processing.



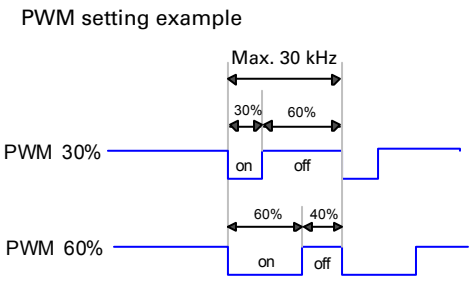


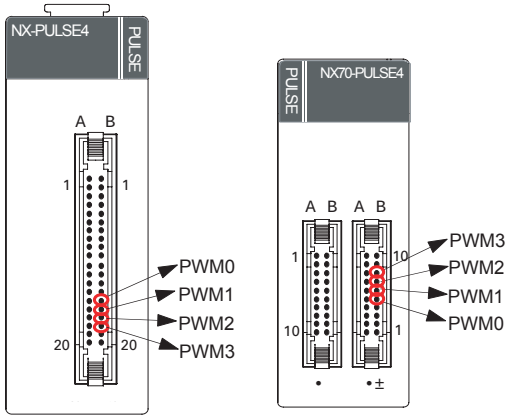
NX700 PLC
Pulse output unit
(NX-PULSE4)

NX70 PLC
Pulse output unit
(NX70-PULSE4)

PWM Output Function

- Pulse I/O unit has 4CH for PWM output.
- Max. 30 kHz is available for PWM output, and Duty can be set by 1% unit.





NX700 PLC
Pulse output unit
(NX-PULSE4)

NX70 PLC
Pulse output unit
(NX70-PULSE4)

ATTENTION Pulse output and PWM output functions are only available on pulse I/O unit.

Configuration and Limit for Pulse I/O Unit

Configuration Limit with Current Consumption

Internal current consumption for Pulse I/O unit is shown below (at 5V). Be careful when configuring system, not to exceed the total capacity limit, considering the consumption of other units.

PLC Model	Name	Catalog number	Current consumption (5V power)	Remarks
NX700 PLC	Pulse I/O unit (4CH)	NX-PULSE4	500 mA	
NX70 PLC	Pulse I/O unit (4CH)	NX70-PULSE4	450 mA	

Mounting of Pulse I/O Unit

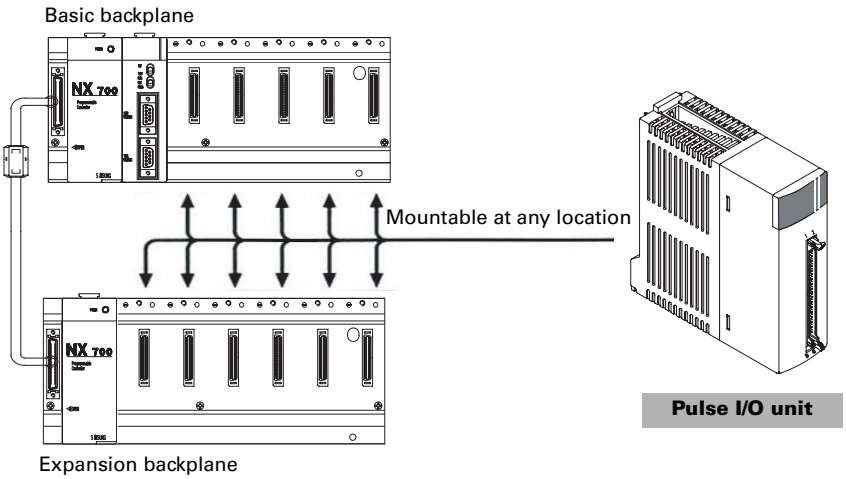
- **For NX700 PLC**

  Pulse I/O unit can be mounted at any location on CPU backplane or expansion backplane.
  But it cannot be mounted on power supply unit or CPU unit slots.
  There is no limit to the number of Pulse I/O unit mounting for NX700 PLC.

- **For NX70 PLC**

  Pulse I/O unit can be mounted at any location on the basic backplane.
  But it cannot be mounted on power supply unit or CPU unit slots.
  There is no limit to the number of Pulse I/O mounting for NX70 PLC.

(Example of NX700 PLC)



NOTE **Pulse I/O unit can be used for only the following CPU modules (models).**

NX700 CPU Module: NX-CPU750A, NX-CPU750B, NX-CPU750C, NX-CPU750D
NX70 CPU Module: NX70-CPU750

Interrupt Points

When used as interrupt unit, a maximum of 2 units can provide eight points each. Other units can use only one point (C mode) for interrupt.

- **Interrupt Functions Available and Interrupt Generation Special Unit**

  Interrupt Function Available

  Pulse I/O unit set to mode B is used as interrupt unit and provides 8 interrupts per each unit.

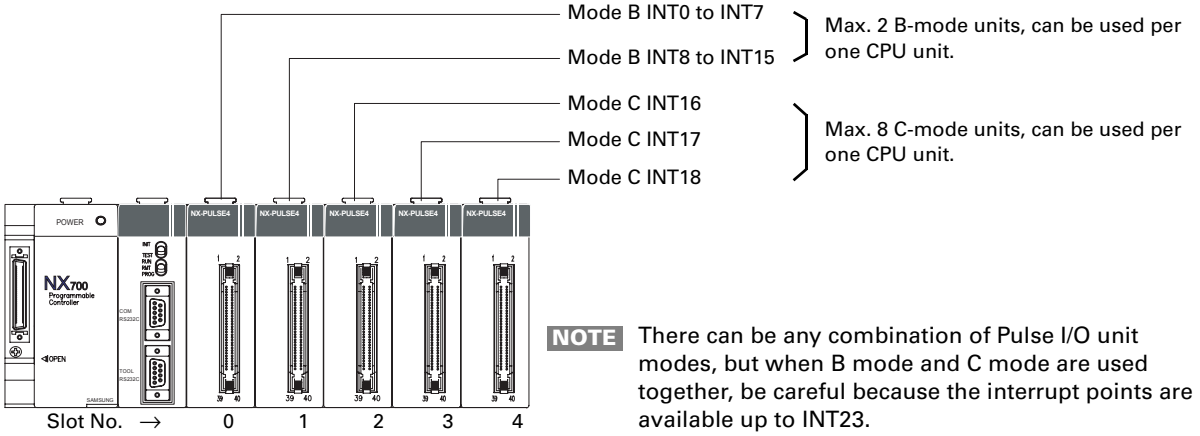
  Be careful because only two mode B units can be used for one CPU unit.

  Interrupt Generation Special Unit

  Pulse I/O unit set to mode C is used as interrupt generation special unit, and provides one interrupt per one unit.

  Be careful because only 8 interrupt generation special units can be used per one CPU unit.

- **Interrupt function with multiple Pulse I/O units**



NOTE There can be any combination of Pulse I/O unit modes, but when B mode and C mode are used together, be careful because the interrupt points are available up to INT23.

Restrictions Due to Combination of Pulse Output Function

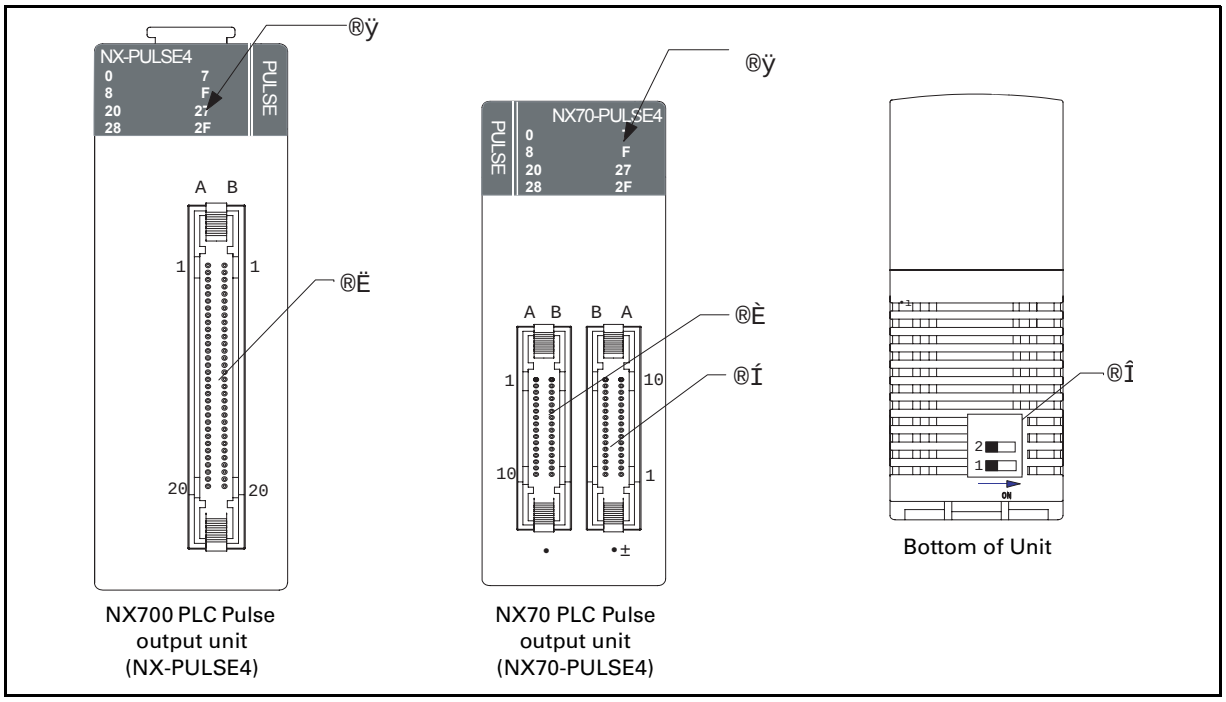
Pulse I/O unit sends out pulse and PWM outputs from the same CH. Up to 4CH are available.

When using combination of pulse and PWM outputs, allocate pulse ahead of PWM as shown in the following table.

Combination	Using CH			
	CH0	CH1	CH2	CH3
1	PWM	PWM	PWM	PWM
2	PLS	PWM	PWM	PWM
3	PLS	PLS	PWM	PWM
4	PLS	PLS	PLS	PWM
5	PLS	PLS	PLS	PLS

Parts and Functions

Parts and Functions



Parts and Functions

① **Status LED**
Turns on I/O status light at the terminal blocks.
See *"Status LED" on page 37* for details.

② **I/O Connector (NX700 PLC)**
Relays output signals to Pulse I/O unit.
See *"Terminal Diagram" on page 39* for details.

③ **Input Connector (NX70 PLC), [I]**
Relays input signals from an external device to the Pulse I/O unit.
See *"Terminal Diagram" on page 39*.

④ **Output Connector (NX70 PLC), [II]**
Relays output signals from the Pulse I/O unit to an external device.
See *"Terminal Diagram" on page 39*.

⑤ **Mode Setting Switch**
Set the interrupt mode of the unit. Available modes are as follows:
- No Interrupt Function
- Interrupt Function (8 Interrupt Points)
- Interrupt Generation Special Unit (1 Interrupt Point)

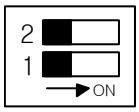
See *"Interrupt Function" in Chapter 8* for details.

ATTENTION Operation mode setting switch turns effective only on power input.

Mode Setting Switch Setting

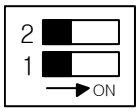
Interrupt function setting with mode setting switch on the bottom of the unit.

Mode Setting Switch



Mode	Switch No		Event
	1	2	
A	OFF	OFF	No interrupt function
B	ON	OFF	Interrupt function (INT0 to INT7)
C	OFF	ON	Interrupt generation special unit (INT0)
D	ON	ON	Unused (Reserved)

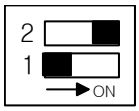
Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

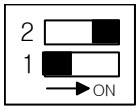
Mode B (SW1 →ON, SW2 →OFF)



Interrupt function (8 interrupt points)

- Max. 8 interrupt points are available per one unit. (INT0 to INT7)
- In this mode, 8 interrupt points (INT0 to INT7) are automatically set regardless of ON/OFF setting of interrupt function

Mode C (SW1 →OFF, SW2 →ON)

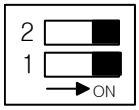


Interrupt generation special unit (1 interrupt point)

- Only one valid interrupt per one unit. (INT0 *1)
- INT1 to INT7 are invalid regardless of interrupt setting.

*1: INT0 indicates the interrupt location on the unit. Interrupt program numbers INT 16 to 23 are available for sequence program setting.

Mode D (SW1 →ON, SW2 →ON)



Reserved

Do not use this setting.

IMPORTANT See *"Interrupt Points" on page 34*

Status LED

Unit LED indicates the I/O status at the terminals. Refer to the table below.

NX700 Pulse I/O unit allocation table (NX-PULSE4)

0	A1	A2	A3	A4	A5	A6	A7	A8	**7**
8	B1	B2	B3	B4	B5	B6	B7	B8	**F**
20	A11	A12	A13	A14	A15	A16	A17	A18	**27**
28	B11	B12	B13	B14	B15	B16	B17	B18	**2F**

[Unit LED Indicator Window]

NX700 Pulse I/O unit (NX-PULSE4)

LED	Functions						LED	Functions					
	Input	Interrupt	Counter	Comparison	Pulse	PWM		Output	Interrupt	Counter	Comparison	Pulse	PWM
A1	X0	-	CH0 IN-A	-	-	-	A11	Y20	-	-	[CMP0]	PLS0 direction	-
A2	X1	-	CH0 IN-B	-	-	-	A12	Y21	-	-	[CMP1]	PLS1 direction	-
A3	X2	-	CH0 Clear	-	-	-	A13	Y22	-	-	[CMP2]	PLS2 direction	-
A4	X3	-	CH0 Mask	-	-	-	A14	Y23	-	-	[CMP3]	PLS3 direction	-
A5	X4	-	CH1 IN-A	-	-	-	A15	Y24	-	-	[CMP4]	-	-
A6	X5	-	CH1 IN-B	-	-	-	A16	Y25	-	-	[CMP5]	-	-
A7	X6	-	CH1 Clear	-	-	-	A17	Y26	-	-	[CMP6]	-	-
A8	X7	-	CH1 Mask	-	-	-	A18	Y27	-	-	[CMP7]	-	-
B1	X8	INT0	CH2 IN-A	-	-	-	B11	Y28	-	-	-	[PLS0 A]	-
B2	X9	INT1	CH2 IN-B	-	-	-	B12	Y29	-	-	-	[PLS0 B]	-
B3	XA	INT2	CH2 Clear	-	-	-	B13	Y2A	-	-	-	[PLS1 A]	-
B4	XB	INT3	CH2 Mask	-	-	-	B14	Y2B	-	-	-	[PLS1 B]	-
B5	XC	INT4	CH3 IN-A	-	-	-	B15	Y2C	-	-	-	[PLS2 A]	[PWM0]
B6	XD	INT5	CH3 IN-B	-	-	-	B16	Y2D	-	-	-	[PLS2 B]	[PWM1]
B7	XE	INT6	CH3 Clear	-	-	-	B17	Y2E	-	-	-	[PLS3 A]	[PWM2]
B8	XF	INT7	CH3 Mask	-	-	-	B18	Y2F	-	-	-	[PLS3 B]	[PWM3]

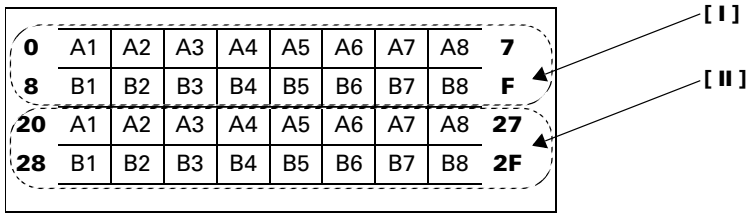
- marks: No output allocation

[ ] marks: Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

- LED indicators may show vibrations when there are high-speed I/O signals, but it does not indicate any malfunctions on the unit.
- The numbers described above are I/O numbers with Pulse I/O unit mounted in slot 0.
  I/O number can differ depending on the installation slot.

NX70 Pulse I/O unit allocation table (NX70-PULSE4)



[Unit LED Indicator Window]

NX70 Pulse I/O unit (NX70-PULSE4)

LED		Functions						LED		Functions					
		Input	Interrupt	Counter	Comparison	Pulse	PWM			Output	Interrupt	Counter	Comparison	Pulse	PWM
[I]	A1	X0	-	CH0 IN-A	-	-	-	[II]	A1	Y20	-	-	[CMP0]	PLS0 direction	-
	A2	X1	-	CH0 IN-B	-	-	-		A2	Y21	-	-	[CMP1]	PLS1 direction	-
	A3	X2	-	CH0 Clear	-	-	-		A3	Y22	-	-	[CMP2]	PLS2 direction	-
	A4	X3	-	CH0 Mask	-	-	-		A4	Y23	-	-	[CMP3]	PLS3 direction	-
	A5	X4	-	CH1 IN-A	-	-	-		A5	Y24	-	-	[CMP4]	-	-
	A6	X5	-	CH1 IN-B	-	-	-		A6	Y25	-	-	[CMP5]	-	-
	A7	X6	-	CH1 Clear	-	-	-		A7	Y26	-	-	[CMP6]	-	-
	A8	X7	-	CH1 Mask	-	-	-		A8	Y27	-	-	[CMP7]	-	-
	B1	X8	INT0	CH2 IN-A	-	-	-		B1	Y28	-	-	-	[PLS0 A]	-
	B2	X9	INT1	CH2 IN-B	-	-	-		B2	Y29	-	-	-	[PLS0 B]	-
	B3	XA	INT2	CH2 Clear	-	-	-		B3	Y2A	-	-	-	[PLS1 A]	-
	B4	XB	INT3	CH2 Mask	-	-	-		B4	Y2B	-	-	-	[PLS1 B]	-
	B5	XC	INT4	CH3 IN-A	-	-	-		B5	Y2C	-	-	-	[PLS2 A]	[PWM0]
	B6	XD	INT5	CH3 IN-B	-	-	-		B6	Y2D	-	-	-	[PLS2 B]	[PWM1]
	B7	XE	INT6	CH3 Clear	-	-	-		B7	Y2E	-	-	-	[PLS3 A]	[PWM2]
	B8	XF	INT7	CH3 Mask	-	-	-		B8	Y2F	-	-	-	[PLS3 B]	[PWM3]

- marks: No output allocation

[ ] marks: Indicate the connector pins to which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

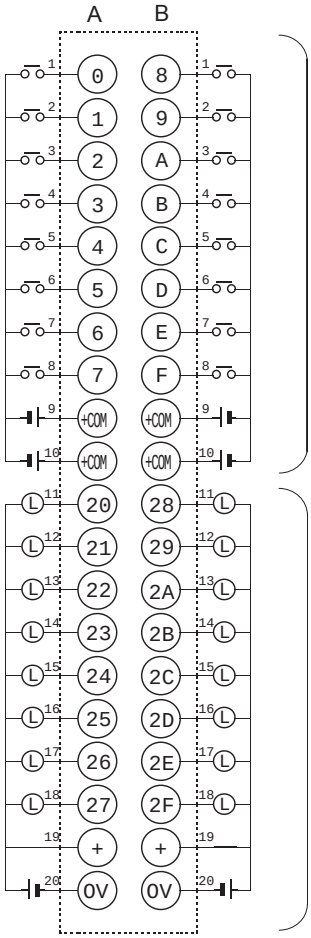
ATTENTION

- LED indicators may show vibrations when there are high-speed I/O signals, but it does not indicate any malfunctions on the unit.
- The numbers described above are I/O numbers with Pulse I/O unit mounted in slot 0.
  I/O number can differ depending on the installation slot.

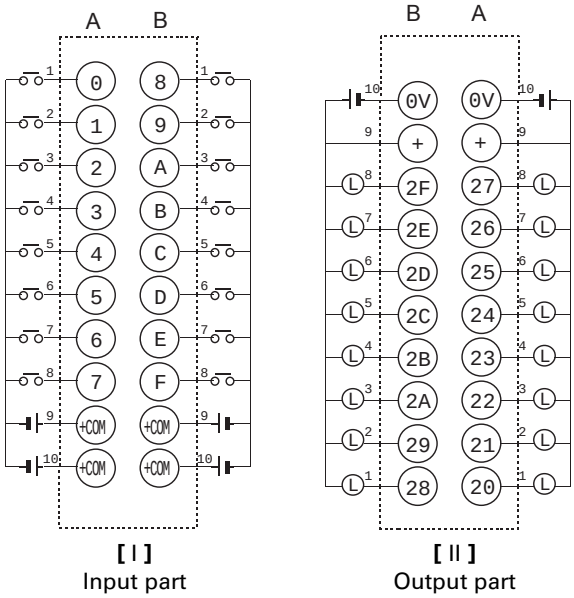
I/O Specifications and Connector Pin Diagram

Terminal Diagram

Terminal arrangement is common to Pulse I/O unit (4CH) and High-performance High-speed counter unit (4CH).



[NX700 Pulse I/O unit (NX-PULSE4)]

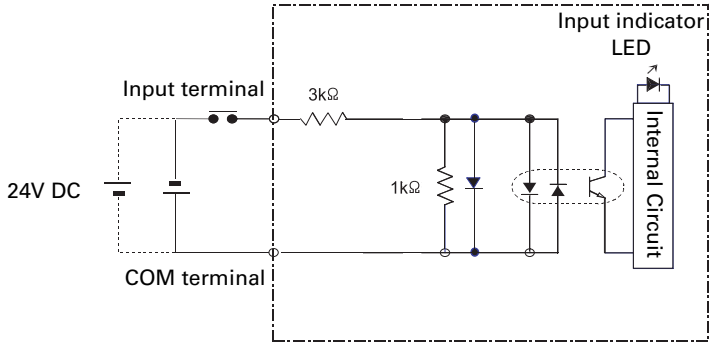


[NX70 Pulse I/O unit (NX70-PULSE4)]

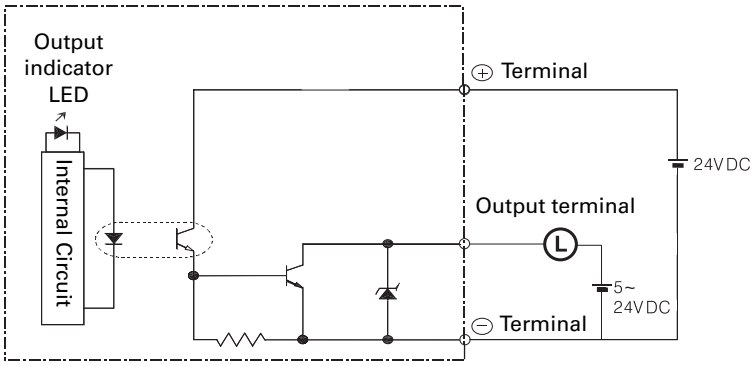
NOTE 4 (+ COM) points, 2 (+) points, and 2 (0V) points are internally connected, respectively.

Internal Circuit Diagram

Input Part



Output Part



3

Configuration and Design Verification of the Unit

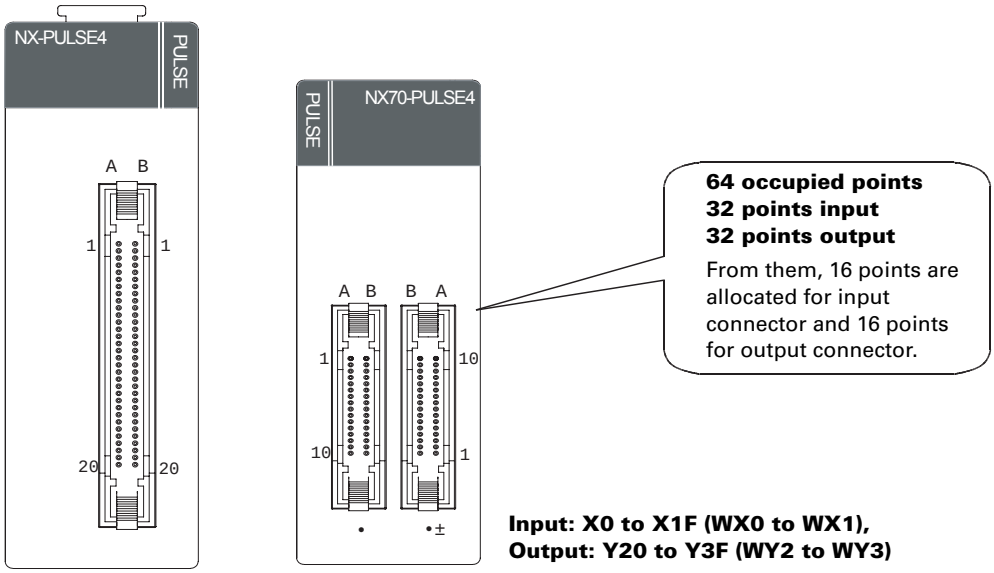
Slot No. and I/O Number Allocation Verification

Occupied I/O Area

As with other I/O units, NX70, NX700 Pulse I/O units also use the allocation for input (X)/output (Y).

NX70, NX700 Pulse I/O units occupy 32 input (X0 to X1F) and 32 output (Y20 to Y3F) points. Occupied I/O area configuration is as follows:

EX) When Pulse I/O unit is installed in slot 0



NX700 PLC
Pulse I/O Unit
(NX-PULSE4)

NX70 PLC
Pulse I/O Unit
(NX70-PULSE4)

Pulse I/O Unit I/O Allocation Table

Input Allocation, NX700 Pulse I/O Unit (NX-PULSE4)

	External Terminal	Functions					
		Input	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	A1	X0	-	CH0 IN-A	-	-	-
	A2	X1	-	CH0 IN-B	-	-	-
	A3	X2	-	CH0 Clear	-	-	-
	A4	X3	-	CH0 Mask	-	-	-
	A5	X4	-	CH1 IN-A	-	-	-
	A6	X5	-	CH1 IN-B	-	-	-
	A7	X6	-	CH1 Clear	-	-	-
	A8	X7	-	CH1 Mask	-	-	-
	B1	X8	Interrupt INT0	CH2 IN-A	-	-	-
	B2	X9	Interrupt INT1	CH2 IN-B	-	-	-
	B3	XA	Interrupt INT2	CH2 Clear	-	-	-
	B4	XB	Interrupt INT3	CH2 Mask	-	-	-
	B5	XC	Interrupt INT4	CH3 IN-A	-	-	-
	B6	XD	Interrupt INT5	CH3 IN-B	-	-	-
	B7	XE	Interrupt INT6	CH3 Clear	-	-	-
	B8	XF	Interrupt INT7	CH3 Mask	-	-	-
Unit Internal I/O	-	X10	-	-	Comparison CMP0	-	-
	-	X11	-	-	Comparison CMP1	-	-
	-	X12	-	-	Comparison CMP2	-	-
	-	X13	-	-	Comparison CMP3	-	-
	-	X14	-	-	Comparison CMP4	-	-
	-	X15	-	-	Comparison CMP5	-	-
	-	X16	-	-	Comparison CMP6	-	-
	-	X17	-	-	Comparison CMP7	-	-
	-	X18	-	-	-	PLS0 A	-
	-	X19	-	-	-	PLS0 B	-
	-	X1A	-	-	-	PLS1 A	-
	-	X1B	-	-	-	PLS1 B	-
	-	X1C	-	-	-	PLS2 A	PWM0
	-	X1D	-	-	-	PLS2 B	PWM1
	-	X1E	-	-	-	PLS3 A	PWM2
	-	X1F	-	-	-	PLS3 B	PWM3

- : No input allocation.

The I/O number allocations above are applied when NX700 PLC Pulse I/O unit (4CH) is installed in slot 0.
I/O number can differ depending on the installation slot.

Input Allocation, NX70 Pulse I/O Unit (NX70-PULSE4)

	External Terminal		Functions					
			Input	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	[I]	A1	X0	-	CH0 IN-A	-	-	-
		A2	X1	-	CH0 IN-B	-	-	-
		A3	X2	-	CH0 Clear	-	-	-
		A4	X3	-	CH0 Mask	-	-	-
		A5	X4	-	CH1 IN-A	-	-	-
		A6	X5	-	CH1 IN-B	-	-	-
		A7	X6	-	CH1 Clear	-	-	-
		A8	X7	-	CH1 Mask	-	-	-
		B1	X8	Interrupt INT0	CH2 IN-A	-	-	-
		B2	X9	Interrupt INT1	CH2 IN-B	-	-	-
		B3	XA	Interrupt INT2	CH2 Clear	-	-	-
		B4	XB	Interrupt INT3	CH2 Mask	-	-	-
		B5	XC	Interrupt INT4	CH3 IN-A	-	-	-
		B6	XD	Interrupt INT5	CH3 IN-B	-	-	-
		B7	XE	Interrupt INT6	CH3 Clear	-	-	-
		B8	XF	Interrupt INT7	CH3 Mask	-	-	-
Unit Internal I/O		-	X10	-	-	Comparison CMP0	-	-
		-	X11	-	-	Comparison CMP1	-	-
		-	X12	-	-	Comparison CMP2	-	-
		-	X13	-	-	Comparison CMP3	-	-
		-	X14	-	-	Comparison CMP4	-	-
		-	X15	-	-	Comparison CMP5	-	-
		-	X16	-	-	Comparison CMP6	-	-
		-	X17	-	-	Comparison CMP7	-	-
		-	X18	-	-	-	PLS0 A	-
		-	X19	-	-	-	PLS0 B	-
		-	X1A	-	-	-	PLS1 A	-
		-	X1B	-	-	-	PLS1 B	-
		-	X1C	-	-	-	PLS2 A	PWM0
		-	X1D	-	-	-	PLS2 B	PWM1
		-	X1E	-	-	-	PLS3 A	PWM2
		-	X1F	-	-	-	PLS3 B	PWM3

- : No input allocation.

The I/O number allocations above are applied when NX70 PLC Pulse I/O unit (4CH) is installed in slot 0.
I/O number can differ depending on the installation slot.

Detailed Descriptions on Occupied I/O points

External Input

X0 to XF ..... **Input**

Operated as input.
It can be monitored as input even though interrupt and counter functions are in use.

INT0 to INT7 .....**Interrupt Function**

Input interrupt signal.

Generates interrupt signal from the input at I/O connector, and runs the interrupt program of the ladder program. This is available only when the connection point is set to input terminal in shared memory interrupt setting.

CHx IN-A, CHx IN-B .....**Counter Function**

Input count signal of counting operation.

Count signal input is IN-A, IN-B.

There are three input modes: 1) Direction control 2) Individual input and 3) Phase input.

CHx Clear .....**Counter Function**

Input when counter current value is to be cleared.

Count current value is cleared to zero (0) with this input.

CHx Mask .....**Counter Function**

Pause counter.

When this input turns on, counter is paused.

Internal input

X10 to X1F .....**Input**

This monitors signals from each function, such as comparison output.

CMP0 to CMP7 .....**Comparison Output Function**

The comparison result of comparison output set value in shared memory and counter current value can be monitored by X10 to X17.

(Counter current value) < (Comparison output set value) →Comparison output: OFF

(Counter current value) ≥ (Comparison output set value) →Comparison output: ON

Comparison output ON/OFF can also be set as reverse operation.

PLSx A, PLSx B .....**Pulse Output Function**

Pulse signals from pulse output function can be monitored with X18 to 1F.
This input reflects pulse signals output to I/O connector as internal input.

PWMx .....**PWM output function**

PWM signals from PWM output function can be monitored with X1C to X1F.
This input reflects PWM signals output to I/O connector as internal input.

Output Allocation, NX700 Pulse I/O unit (NX-PULSE4)

	External Terminal	Functions					
		Output	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	A11	Y20	-	-	[Comparison CMP0]	PLS0 direction	-
	A12	Y21	-	-	[Comparison CMP1]	PLS1 direction	-
	A13	Y22	-	-	[Comparison CMP2]	PLS2 direction	-
	A14	Y23	-	-	[Comparison CMP3]	PLS3 direction	-
	A15	Y24	-	-	[Comparison CMP4]	-	-
	A16	Y25	-	-	[Comparison CMP5]	-	-
	A17	Y26	-	-	[Comparison CMP6]	-	-
	A18	Y27	-	-	[Comparison CMP7]	-	-
	B11	Y28	-	-	-	[PLS0 A]	-
	B12	Y29	-	-	-	[PLS0 B]	-
	B13	Y2A	-	-	-	[PLS1 A]	-
	B14	Y2B	-	-	-	[PLS1 B]	-
	B15	Y2C	-	-	-	[PLS2 A]	[PWM0]
	B16	Y2D	-	-	-	[PLS2 B]	[PWM1]
	B17	Y2E	-	-	-	[PLS3 A]	[PWM2]
	B18	Y2F	-	-	-	[PLS3 B]	[PWM3]
Unit Internal I/O	-	Y30	-	CH0 Soft Clear	-	-	-
	-	Y31	-	CH0 Soft Mask	-	-	-
	-	Y32	-	CH1 Soft Clear	-	-	-
	-	Y33	-	CH1 Soft Mask	-	-	-
	-	Y34	-	CH2 Soft Clear	-	-	-
	-	Y35	-	CH2 Soft Mask	-	-	-
	-	Y36	-	CH3 Soft Clear	-	-	-
	-	Y37	-	CH3 Soft Mask	-	-	-
	-	Y38	-	-	-	PLS0 enabled	PWM0 enabled
	-	Y39	-	-	-	PLS1 enabled	PWM1 enabled
	-	Y3A	-	-	-	PLS2 enabled	PWM2 enabled
	-	Y3B	-	-	-	PLS3 enabled	PWM3 enabled
	-	Y3C	-	-	-	PLS0 start	PWM0 start
	-	Y3D	-	-	-	PLS1 start	PWM1 start
	-	Y3E	-	-	-	PLS2 start	PWM2 start
	-	Y3F	-	-	-	PLS3 start	PWM3 start

- : No output allocation

[ ] : Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

The I/O number allocations above are applied when NX700 PLC Pulse I/O unit (4CH) is installed in slot 0. I/O number can differ depending on the installation slot.

Output Allocation, NX70 Pulse I/O unit (NX70-PULSE4)

	External Terminal		Functions					
			Output	Interrupt	Counter	Comparison	Pulse	PWM
External Terminal	[II]	A1	Y20	-	-	[Comparison CMP0]	PLS0 direction	-
		A2	Y21	-	-	[Comparison CMP1]	PLS1 direction	-
		A3	Y22	-	-	[Comparison CMP2]	PLS2 direction	-
		A4	Y23	-	-	[Comparison CMP3]	PLS3 direction	-
		A5	Y24	-	-	[Comparison CMP4]	-	-
		A6	Y25	-	-	[Comparison CMP5]	-	-
		A7	Y26	-	-	[Comparison CMP6]	-	-
		A8	Y27	-	-	[Comparison CMP7]	-	-
		B1	Y28	-	-	-	[PLS0 A]	-
		B2	Y29	-	-	-	[PLS0 B]	-
		B3	Y2A	-	-	-	[PLS1 A]	-
		B4	Y2B	-	-	-	[PLS1 B]	-
		B5	Y2C	-	-	-	[PLS2 A]	[PWM0]
		B6	Y2D	-	-	-	[PLS2 B]	[PWM1]
		B7	Y2E	-	-	-	[PLS3 A]	[PWM2]
		B8	Y2F	-	-	-	[PLS3 B]	[PWM3]
Unit Internal I/O		-	Y30	-	CH0 Soft Clear	-	-	-
		-	Y31	-	CH0 Soft Mask	-	-	-
		-	Y32	-	CH1 Soft Clear	-	-	-
		-	Y33	-	CH1 Soft Mask	-	-	-
		-	Y34	-	CH2 Soft Clear	-	-	-
		-	Y35	-	CH2 Soft Mask	-	-	-
		-	Y36	-	CH3 Soft Clear	-	-	-
		-	Y37	-	CH3 Soft Mask	-	-	-
		-	Y38	-	-	-	PLS0 enabled	PWM0 enabled
		-	Y39	-	-	-	PLS1 enabled	PWM1 enabled
		-	Y3A	-	-	-	PLS2 enabled	PWM2 enabled
		-	Y3B	-	-	-	PLS3 enabled	PWM3 enabled
		-	Y3C	-	-	-	PLS0 start	PWM0 start
		-	Y3D	-	-	-	PLS1 start	PWM1 start
		-	Y3E	-	-	-	PLS2 start	PWM2 start
		-	Y3F	-	-	-	PLS3 start	PWM3 start

- : No output allocation

[ ] : Indicate the connector pins on which the comparison results are directly output in order to send to an external device. But the signal states are saved in the input contacts, X10 to X 17, so that you can monitor them with the programming software.

ATTENTION

The I/O number allocations above are applied when NX700 PLC Pulse I/O unit (4CH) is installed in slot 0. I/O number can differ depending on the installation slot.

Detailed Descriptions on Occupied I/O Points

External Output

Y20 to Y2F .....**Output**

Operated as output.

But, if there is high-performance output allocation, high-performance output is sent to I/O connector.

It can be used as internal relay when not being used for external output.

PLSx direction .....**Pulse Output Function**

Pulse output is directed to Y20 to Y23.
This output can be used together with comparison result output CMPx. In that case, comparison result is sent to I/O connect and pulse can be directed with this Y output.

CMP0 to CMP7 .....**Comparison Output Function**

Comparison result output that has been calculated by comparison output functions.

This output is directly allocated to external output terminal (NX700: A11 to A18,
NX70: **[** II **]** A1 to A8), and its output (Y) (Y20 to Y27) can be used for PLS direction or internal relay. Comparison output can be monitored by internal input (X) with same name.

PLSx A, PLSx B .....**Pulse output function**

Pulse generated by pulse output functions is sent out.
There are A and B types of signal outputs. This output is directly allocated to external output terminal (NX700: B11 to B18,
NX70: **[** II **]** B1 to B8), and output (Y) (Y28 to Y2F) can be used as internal relay. Comparison output can be monitored by internal input with the same name (X).

PWMx .....**PWM Output Functions**

PWM signals generated by PWM output functions are sent out.
This output is directly allocated to external output terminal (NX700: B15 to B18,
NX70: **[** II **]** B5 to B8), and output (Y) (Y2C to Y2F) can be used as internal relay. Comparison output can be monitored with input with the same name (X).

Internal Output

Y30 to Y3F .....**Output**

This output is a controlling signal for each function such as counter function.

It can be used as internal relay when not allocated to any function.

CHx Soft Clear .....**Counter Function**

Output when counter current value is to be cleared.

Counter current value is cleared to zero (0) by this output (Y30, Y32, Y34, Y36).

CHx Soft Mask .....**Counter Function**

Output for counter pause.

When this output (Y31, Y33, Y35, Y37) turns on, counter is paused.

PLSx Enable .....**Pulse output function**

This signal enables pulse output.
Pulse output is available while this input (Y38 to Y3B) is ON.

PLSx start .....**Pulse output function**

This signal starts pulse output (Y3C to Y3F).
Valid only when set to Enable.

PWMx Enable .....**PWM Output Function**

This signal enables PWM output.
PWM output is available while this inputs (Y38 to Y3B) are ON.

PWMx start .....**PWM Output Function**

This signal starts PWM output (Y3C to Y3F).
Valid only when set to Enable.

Verification of Allocated I/O Number and Slot No.

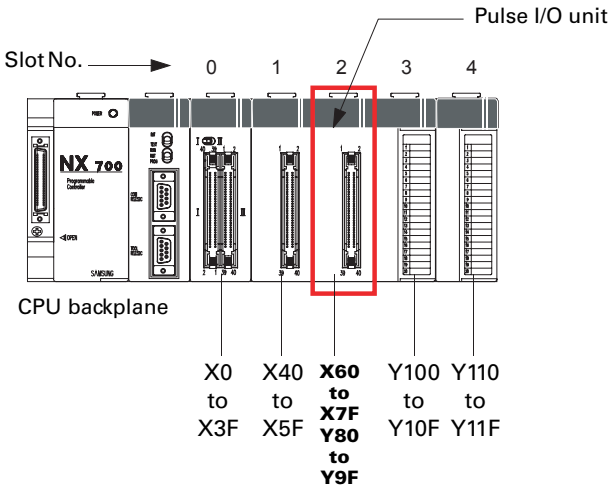
- I/O number and slot number are necessary for programming.
- I/O number changes with backplane installation location. Make sure it is the same as design.
- For I/O allocation, See *"I/O Number Allocation" in Chapter 3* of each PLC system manual.

I/O Number Allocation Verification

Check the occupied I/O areas of the entire unit where Pulse I/O units are installed.

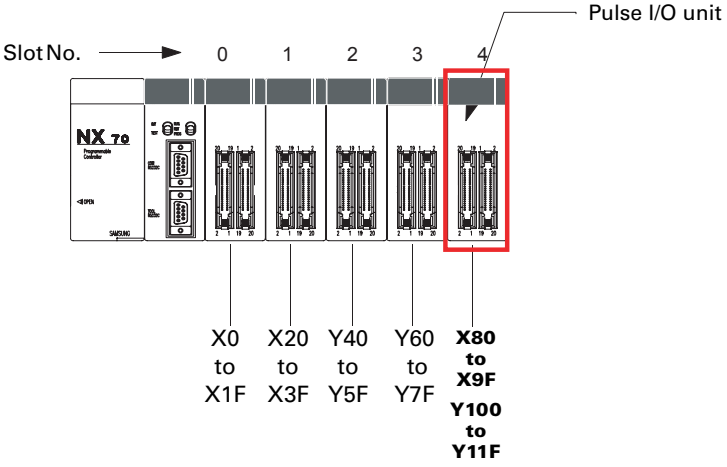
EX] When Pulse I/O unit is installed next to CPU backplane I/O unit x 2.

For NX700 PLC



EX] When Pulse I/O unit is installed next to CPU backplane I/O unit x 4.

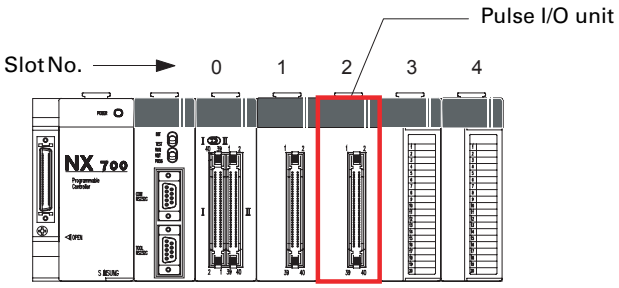
For NX70 PLC



Verification of Slot No.

When mounted on CPU backplane

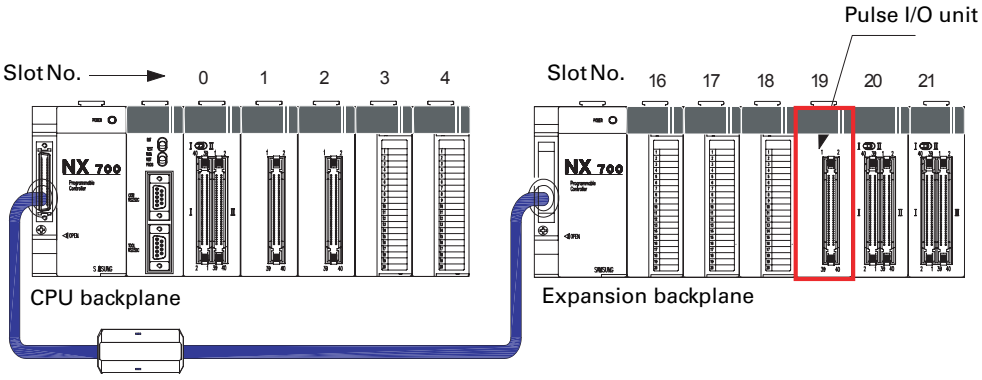
The first slot on the right of CPU is 0, and the others are numbered as their location order.



CPU backplane

When mounted on expansion backplane

Set the slot on the right of power supply unit on expansion backplane as **No. 16.**



CPU backplane

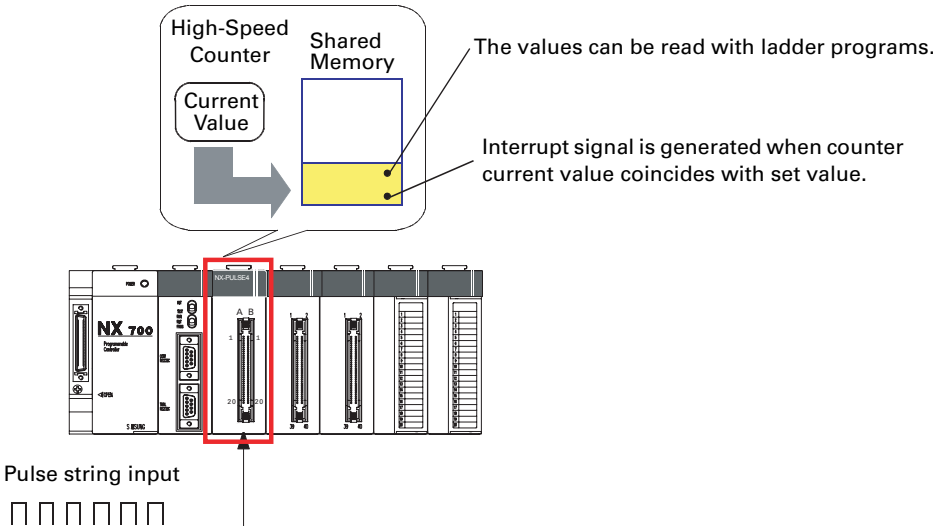
Expansion backplane

Embedded Counter

Embedded Counter Functions

Embedded Counter Functions

- Input pulse counting functions are embedded in the Pulse I/O unit.
- Counted values are stored in the shared memory areas of each channel.
- Stored values can be read by a program, so current value can be checked.
- With comparison functions, external output can be set according to count value.


High-Speed Counter
Shared Memory
Current Value
The values can be read with ladder programs.
Interrupt signal is generated when counter current value coincides with set value.
NX 700
Pulse string input

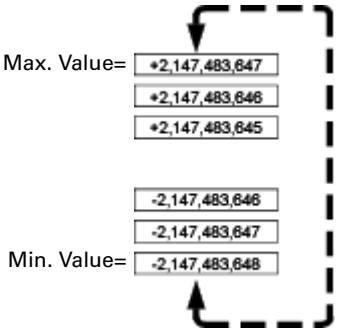
Embedded Counter Operation

- Count value is set to zero (0) on power off.
- Count value (current value) stored in shared memory can be read with user program instructions (F150/P150).
- Count value (current value) can be modified with user program instructions (F151/P151).

Count Range of the Counter

-2,147,483,648 to +2,147,483,647 (signed 32-bit)

When current value exceeds max. (min.), it returns to min. (max.) without error. In this case no error occurs.



Shared Memory Address for Storing Counter Value

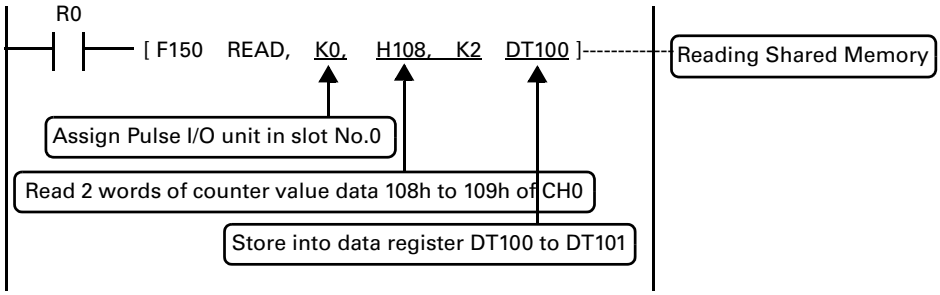
Share Memory Address (heximal)		Event	
CH0	108h, 109h	Current value count	Signed 32-bit -2,147,483,648 to +2,147,483,647
CH1	10Ah, 10Bh		
CH2	10Ch, 10Dh		
CH3	10Eh, 10Fh		

Read Current Value

Use advanced instructions (F150/P150) to read the count value (current value) from the shared memory of Pulse I/O unit.

About F150 (READ) · P150 (PREAD) Instructions

Data reading instructions from shared memory of special unit.


R0
[F150 READ, K0, H108, K2 DT100]
Reading Shared Memory
Assign Pulse I/O unit in slot No.0
Read 2 words of counter value data 108h to 109h of CH0
Store into data register DT100 to DT101

Description

Read 2 words of counter current value data of CH0, stored in shared memory of Pulse I/O unit mounted in slot 0, and store the data in DT100 to DT101 of CPU unit.

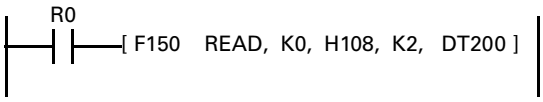
About Assigned Address

Data (current value) is stored as 32-bit data.

Share Memory Address (heximal)		Event	
CH0	108h, 109h	Current value count	Signed 32-bit -2,147,483,648 to +2,147,483,647
CH1	10Ah, 10Bh		
CH2	10Ch, 10Dh		
CH3	10Eh, 10Fh		

Program Example

When reading the counter current value to a certain data register (DT200)

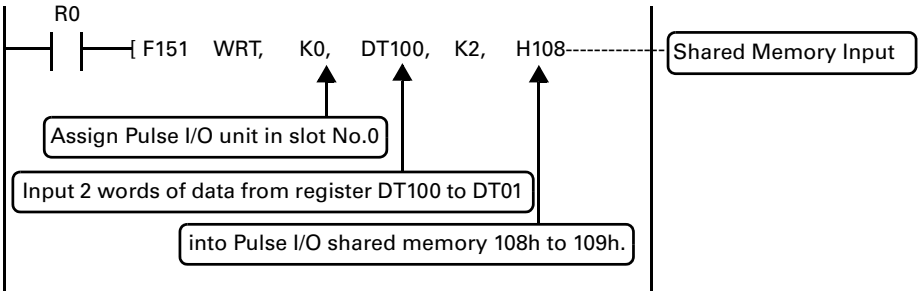


Current Value Input

Use advanced instructions (F151/P151) to enter the count value (current value) into the shared memory of Pulse I/O unit.

About F151 (WRT) · P151 (PWRT) Instructions

Data input instructions into shared memory of special unit.


R0
[F151 WRT, K0, DT100, K2, H108
Shared Memory Input
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT01
into Pulse I/O shared memory 108h to 109h.

Description

Store 2 words of data from CPU unit DT100 to DT101 into counter current value data stored in Pulse I/O unit shared memory.

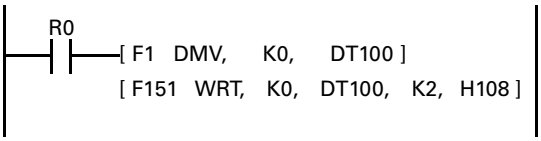
About Assigned Address

Data (current value) is stored as 32-bit data.

Share Memory Address (heximal)			Event
CH0	108h, 109h	Current value count	Signed 32-bit -2,147,483,648 to +2,147,483,647
CH1	10Ah, 10Bh		
CH2	10Ch, 10Dh		
CH3	10Eh, 10Fh		

Program example

When entering zero (0) into counter current value



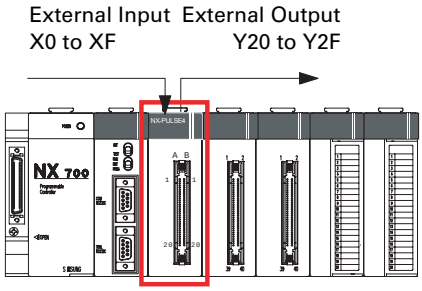
4

General I/O Function

General I/O Function

What is General I/O Function?

- General I/O function means the general I/O, represented by input and output units.
  Pulse I/O unit has high-performance functions like counter function, but I/O without allocations for high-performance functions is used for general I/O functions.
- When used along with input time constant functions, it can be used as I/O with input time constant functions, which provides high-performance I/O with stronger noise immunity.



- The I/O number allocations above are applied when Pulse I/O unit is installed in slot 0.

How to use General I/O Function?

All I/O of Pulse I/O unit can be used for general I/O function. But when high-performance functions are allocated, such as high-speed counter function, the allocated functions have higher priority.

Using Method

- Special settings such as mode setting switch or shared memory settings are not needed for general I/O unit usage.
  Use with initial setting.
- When Pulse I/O unit is installed in slot 0, input X0 to XF and output Y20 to Y2F can be used for external I/O contacts.

IMPORTANT Terminals not allocated for functions can be used for general I/O, which provides system configuration without losses, including counter functions and sensor input only with a single Pulse I/O unit.

Input Time Constant Function

Input Time Constant Function

What is Input Time Constant Function?

- Setting the effective pulse width for the input signals from external input terminal. Input signal whose pulse width is smaller than the effective pulse width is considered noise.
- Time constant can be selected from the following, and width signals over the set value are recognized as signals.

  1) 4 μs
  2) 8 μs
  3) 16 μs
  4) 32 μs

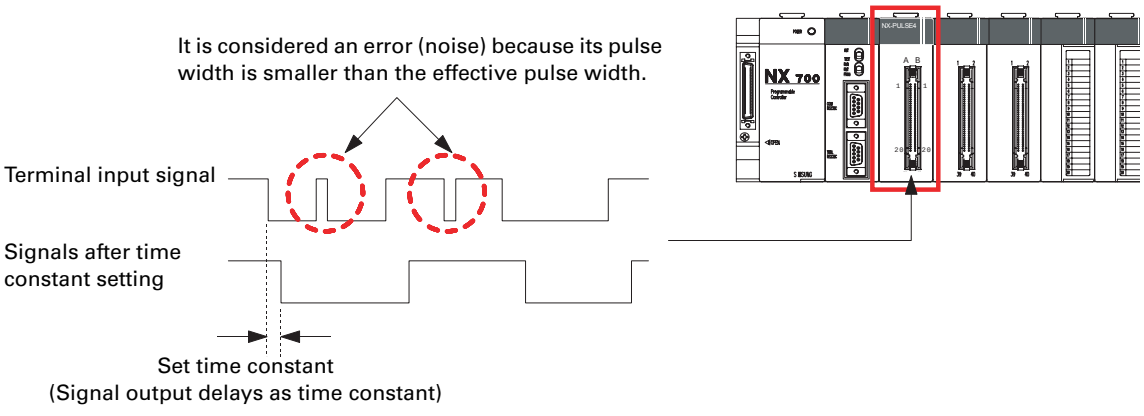
- Time constant can be set individually for each of 8 external input terminal groups.

	External input terminal	Input allocation
1)	A1, A2	X0, X1
2)	A3, A4	X2, X3
3)	A5, A6	X4, X5
4)	A7, A8	X6, X7
5)	B1, B2	X8, X9
6)	B3, B4	XA, XB
7)	B5, B6	XC, XD
8)	B7, B8	XE, XF

(NX700 Pulse I/O unit NX-PULSE4)

	External input terminal [I]	Input allocation
1)	A1, A2	X0, X1
2)	A3, A4	X2, X3
3)	A5, A6	X4, X5
4)	A7, A8	X6, X7
5)	B1, B2	X8, X9
6)	B3, B4	XA, XB
7)	B5, B6	XC, XD
8)	B7, B8	XE, XF

(NX70 Pulse I/O unit NX70-PULSE4)


It is considered an error (noise) because its pulse width is smaller than the effective pulse width.
Terminal input signal
Signals after time constant setting
Set time constant
(Signal output delays as time constant)
NX 700
NX-PULSE4

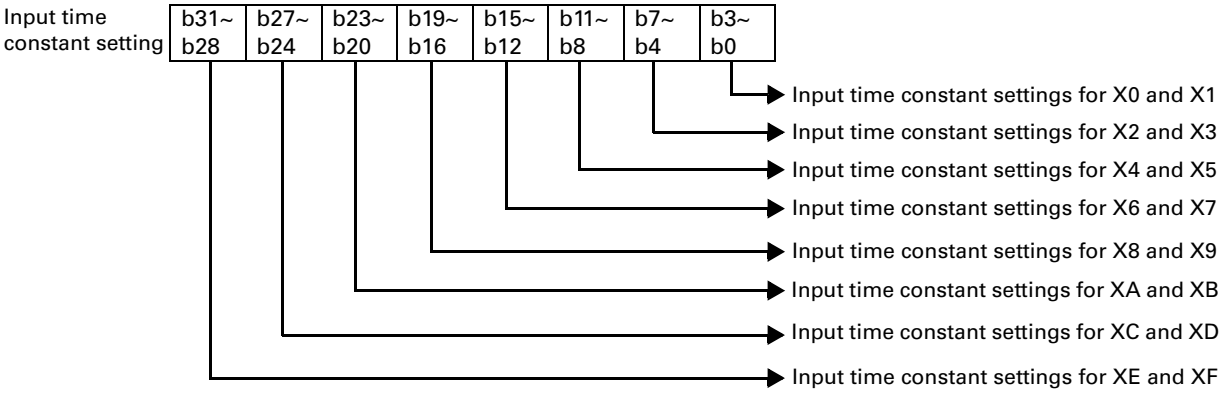
IMPORTANT Input constant functions can be used along with interrupt and counter functions.

Input Time Constant Functions

- To use input time constant functions, shared memory setting is needed.

Using Method

- Set input constant for 8 external input terminal groups by setting shared memory.
- Input time constant is set for external output terminal, so function allocations for each of input X0 to XF settings are also valid. (Counter input, interrupt input)


Input time constant setting
b31~ b28
b27~ b24
b23~ b20
b19~ b16
b15~ b12
b11~ b8
b7~ b4
b3~ b0
Input time constant settings for X0 and X1
Input time constant settings for X2 and X3
Input time constant settings for X4 and X5
Input time constant settings for X6 and X7
Input time constant settings for X8 and X9
Input time constant settings for XA and XB
Input time constant settings for XC and XD
Input time constant settings for XE and XF

Input Time Constant Setting

Set value (HEX)	Functions	
	Input time constant	Effective pulse width
0	Used	4 μs
1		8 μs
2		16 μs
3		32 μs
4	Invalid *1	Invalid *1
5		
6		
7		
8		
9		
A		
B		
C		
D		
E		
F	Unused *2	-

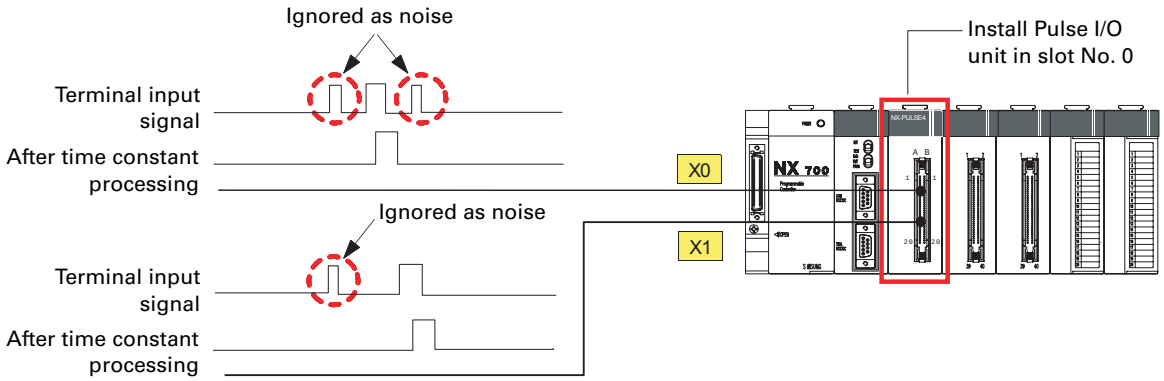
*1: Do not use this setting.

*2: Initial value on power input is set to unused.

ATTENTION Make sure to access shared memory by 2 word units.

Use Input Time Constant Function

Overview

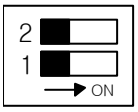


Set time constant for X0, X1 input, and ignore signals outside the width as noise.

Mode Setting Switch Setting

Set mode A when interrupt is unused.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Time constant setting

Set input time constant.
In the example, time constant of 16 μs is set for X0 and X1 input.
Therefore, enter 「FFFFFFF2」into shared memory address 13Ch and 13Dh.

Shared memory 13Ch, 13Dh settings

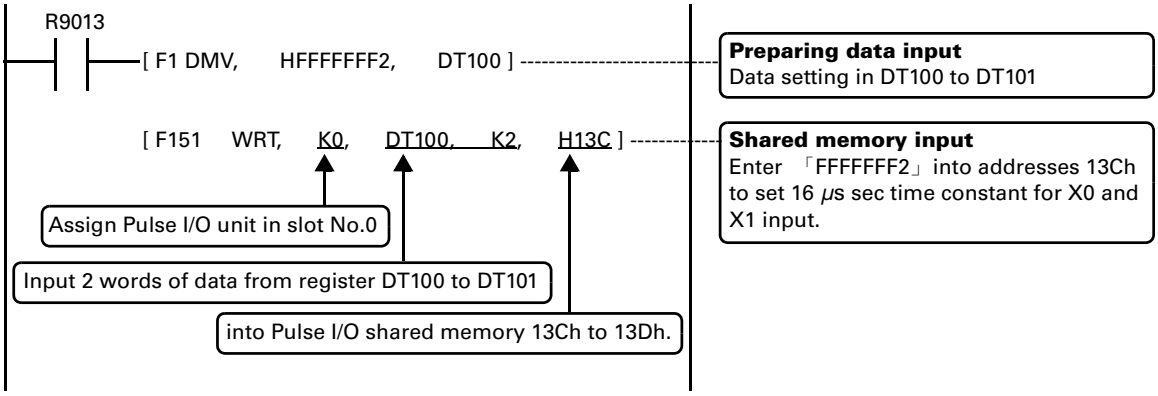
(bit) 32	16	15	0

External input	XF, XE	XD, XC	XB, XA	X9, X8	X7, X6	X5, X4	X3, X2	X1, X0
Set value	F	F	F	F	F	F	F	2
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	16 μs

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Sample Program

Enter「FFFFFFF2」 into the time constant setting area of shared memory (13Ch, 13Dh), and set 16 μs time constant for X0 and X1 input.


R9013
[F1 DMV, HFFFFFFF2, DT100]
[F151 WRT, K0, DT100, K2, H13C]
Preparing data input
Data setting in DT100 to DT101
Shared memory input
Enter 「FFFFFFF2」 into addresses 13Ch to set 16 μs sec time constant for X0 and X1 input.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 13Ch to 13Dh.

High-Speed Counter Function

High-Speed Counter Function

What is Counter Function?

- Counter function counts the input pulse number and reflects it into the current value. Also, it sets the offset value by recording data into the current value.
- Pulse I/O unit has 4 channels of 2 phase input counter. There are three types of 2 phase input mode as follows.

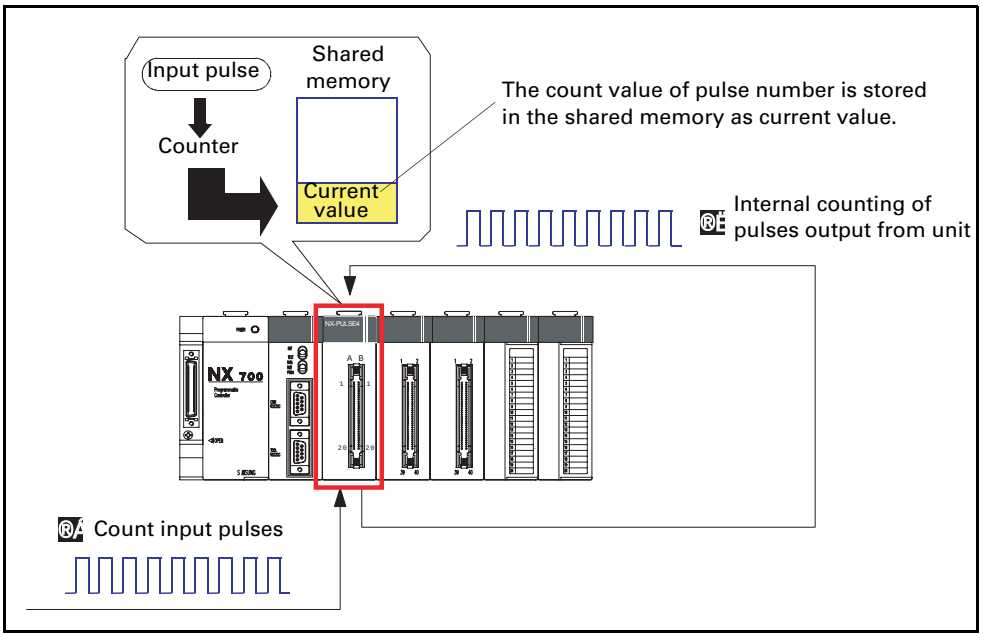
  1) Direction Control Mode

  2) Individual Input Mode

  3) Phase Input Mode
- Particular to Pulse I/O unit, the connection point (condition) of pulse signals to be counted can be selected.

  ① Counting inputs from I/O connector.

  ② Pulses generated from pulse output or PWM output function are counted via internal connection.

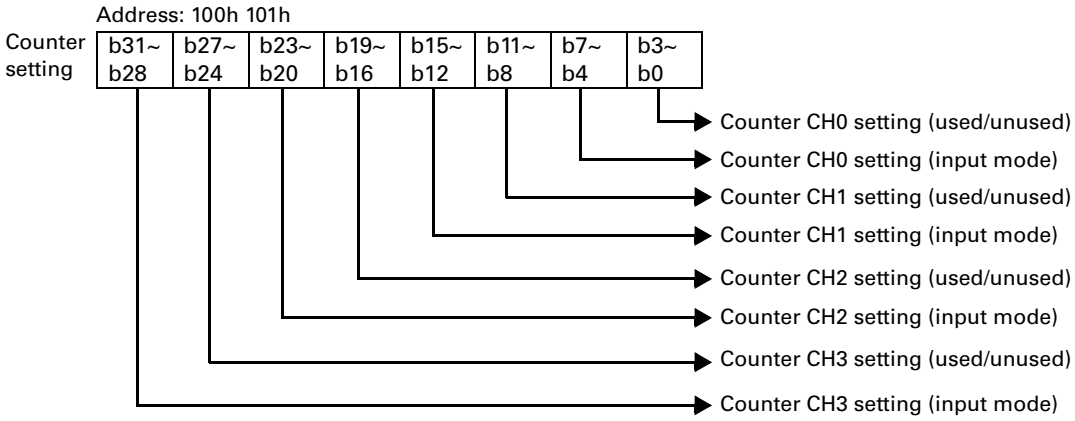

Input pulse
Counter
Shared memory
Current value
The count value of pulse number is stored in the shared memory as current value.
Internal counting of pulses output from unit
NX 700
Count input pulses

Setting Counter Function

- To use counter function, shared memory setting is needed.
- Besides shared memory setting, counter can be masked or cleared with counter control signal.

Step ①. Shared Memory Setting

Set the operation mode for each counter CH in the shared memory settings. Set the counter functions mode as shown in the table below.



Setting (Input Mode)...Effective only for terminal input

Set value (HEX)	Functions	
	Terminal input mode	Multiplication
0	Direction control *3	N/A
1	Individual input	
2	Phase input	1 multiplication
3		2 multiplications
4		4 multiplications
5	Invalid *2	
6		
7		
8		
9		
A		
B		
C		
D		
E		
F		

Setting (Function)

Set value (HEX)	Functions
	Counter
0	Used (Terminal input)
1	
2	Used (Internal connection) *1
3	
4	
5	Invalid *2
6	
7	
8	
9	
A	
B	
C	
D	
E	
F	Unused *3

*1: Used when counting the number of output pulses via internal connection to pulse or PWM output.

*2: Do not use this setting.

*3: Initial values on power input are set as direction control for input mode and unused for function setting.

ATTENTION

- Make sure to access shared memory by 2 word units.
- Internal connection between the counter and pulse/PWM output is fixed on the CHs for counter and pulse/PWM output.
- When pulse/PWM output are internally connected to counter, the input mode of counter is automatically configured to the input mode. Be careful that previously configured counter input mode is ignored.

Step ②. Counter Control Signal

- Counter functions can set mask or clear with counter control signal.
- There are two types of counter control signals as follows: **Control by external input terminal** and **Control by programming**. Both allow counter control.

Control by external input terminal

Control Signals (External input terminal)

External terminal			Input allocation	Function		
NX700	NX70			Subject counter	Control events	Remarks
A3	[I]	A3	X2	CH0	Clear	Count current value is cleared to 0 with input ON.
A4		A4	X3		Mask	Count is paused with input ON.
A7		A7	X6	CH1	Clear	Count current value is cleared to 0 with input ON.
A8		A8	X7		Mask	Count is paused with input ON.
B3		B3	XA	CH2	Clear	Count current value is cleared to 0 with input ON.
B4		B4	XB		Mask	Count is paused with input ON.
B7		B7	XE	CH3	Clear	Count current value is cleared to 0 with input ON.
B8		B8	XF		Mask	Count is paused with input ON.

Control by programming

Control Signals (Internal output terminal)

Output allocation	Function		
	Subject counter	Control events	Remarks
Y30	CH0	Clear	Count current value is cleared to 0 with output ON.
Y31		Mask	Count is paused with output ON.
Y32	CH1	Clear	Count current value is cleared to 0 with output ON.
Y33		Mask	Count is paused with output ON.
Y34	CH2	Clear	Count current value is cleared to 0 with output ON.
Y35		Mask	Count is paused with output ON.
Y36	CH3	Clear	Count current value is cleared to 0 with output ON.
Y37		Mask	Count is paused with output ON.

ATTENTION

Be careful that when counter output is internally connected, the control input (by external terminal) from I/O connector is ignored.

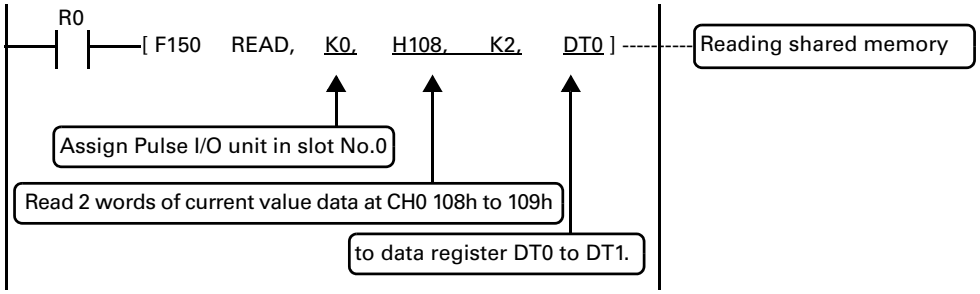
Read Counter Current Value

- Current value of each counter is stored in shared memory as described below.
- Use F150 and P150 instructions (reading data from high-performance units) to read the current value by 2 word units.

	Address: 108h 109h
Counter CH0 Current value	K-2,147,483,648 to K+2,147,483,647
	Address: 10Ah 10Bh
Counter CH1 Current value	K-2,147,483,648 to K+2,147,483,647
	Address: 10Ch 10Dh
Counter CH2 Current value	K-2,147,483,648 to K+2,147,483,647
	Address: 10Eh 10Fh
Counter CH3 Current value	K-2,147,483,648 to K+2,147,483,647

Ex

- Following is an example of storing the current value from counter CH0 to DT0, using F150 instruction.


R0
[F150 READ, K0, H108, K2, DT0]
Reading shared memory
Assign Pulse I/O unit in slot No.0
Read 2 words of current value data at CH0 108h to 109h
to data register DT0 to DT1.

Current Value Input

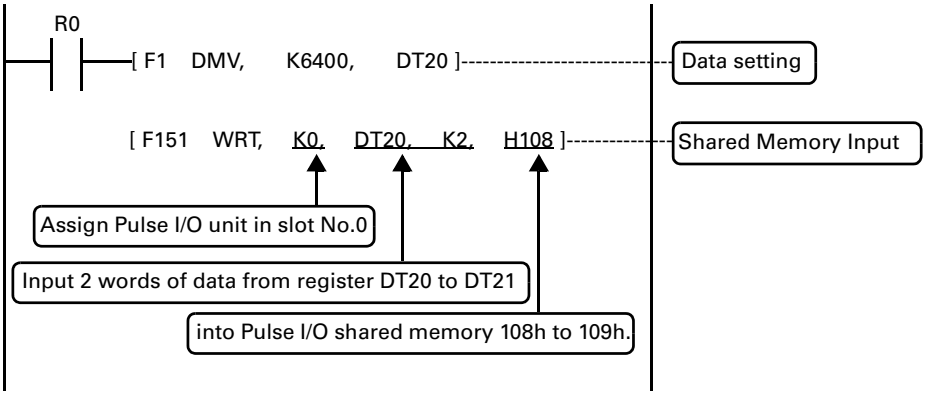
- Current value of each counter is stored in shared memory as described below.
- Enter current value by 2 word units, using F151, P151 instructions (data writing at high-performance unit).

Counter CH0 Current value	Address: 108h 109h	K-2,147,483,648 to K+2,147,483,647
Counter CH1 Current value	Address: 10Ah 10Bh	K-2,147,483,648 to K+2,147,483,647
Counter CH2 Current value	Address: 10Ch 10Dh	K-2,147,483,648 to K+2,147,483,647
Counter CH3 Current value	Address: 10Eh 10Fh	K-2,147,483,648 to K+2,147,483,647

IMPORTANT Counter offset value can be set by counter current value input.

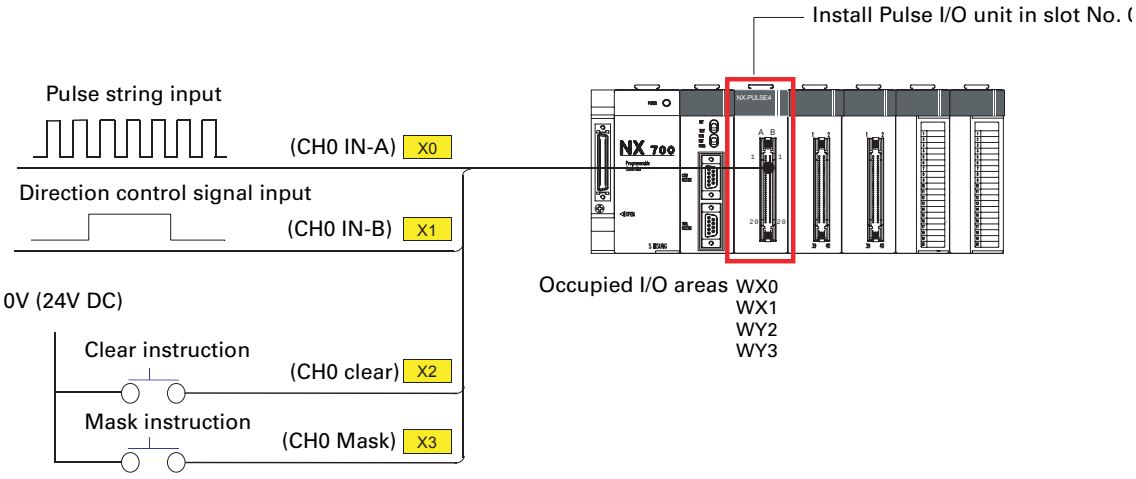
Ex

Following is an example of entering the stored input data at DT20 as counter CH0 current value, using F151 instruction.


R0
[F1 DMV, K6400, DT20]
Data setting
[F151 WRT, K0, DT20, K2, H108]
Shared Memory Input
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT20 to DT21
into Pulse I/O shared memory 108h to 109h.

Count Function Available as Direction Control Mode

Overview

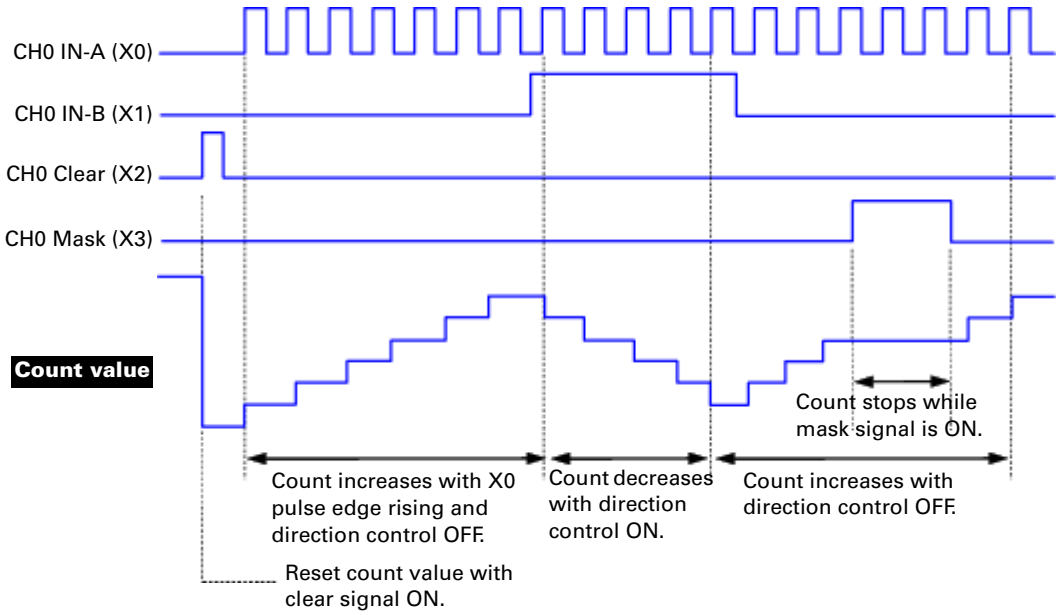


Input pulse string in X0 and direction control signal in X1 and measure the count number.

Counter current value is cleared with X2 clear instruction, and count operation is paused with X3 mask instruction.

Time Chart

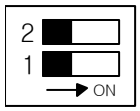
Count value changes according to the input status of each signal as illustrated below. Count value changes at the pulse input edge rise time.


CH0 IN-A (X0)
CH0 IN-B (X1)
CH0 Clear (X2)
CH0 Mask (X3)
Count value
Count stops while mask signal is ON.
Count increases with X0 pulse edge rising and direction control OFF.
Count decreases with direction control ON.
Count increases with direction control OFF.
Reset count value with clear signal ON.

Mode Setting Switch Setting

Set to Mode A when counter function is in use without interrupt function.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.

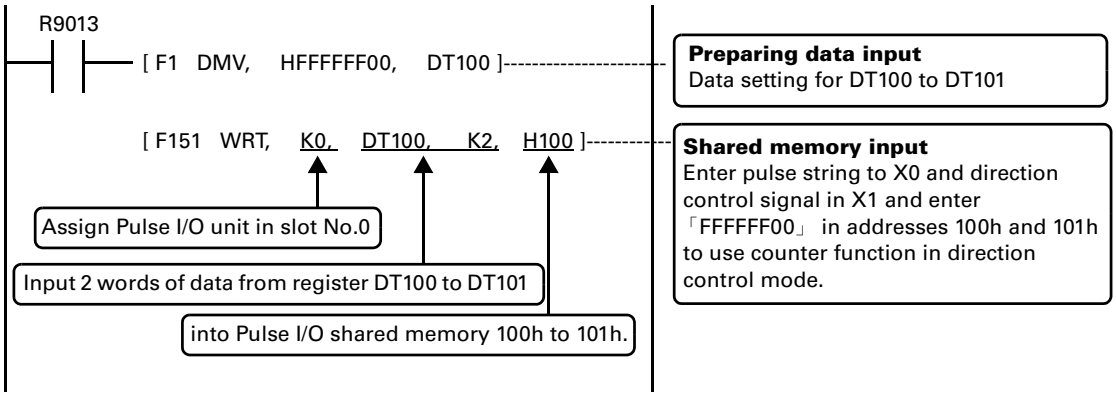
In the example, pulse string is input to X0 and direction control signal to X1, and counter function is used in direction control mode. Enter 「FFFFFF00」 to shared memory addresses 100h and 101h.

Shared memory 100h, 101h settings

(bit) 32				16 15				0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Terminal Input

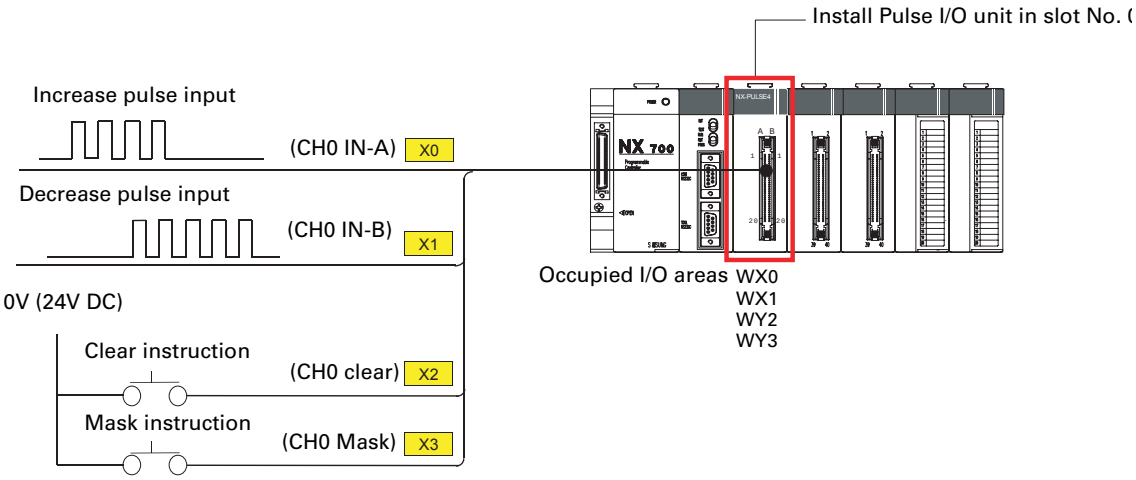
Sample Program

Enter 「FFFFFF00」 in shared memory address counter setting area (100h, 101h), and enter pulse string in X0, direction control in X1, and therefore set the counter function to direction control mode.


R9013
[F1 DMV, HFFFFFF00, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 100h to 101h.
Preparing data input
Data setting for DT100 to DT101
Shared memory input
Enter pulse string to X0 and direction control signal in X1 and enter 「FFFFFF00」 in addresses 100h and 101h to use counter function in direction control mode.

Count Function Available as Individual Input

Overview

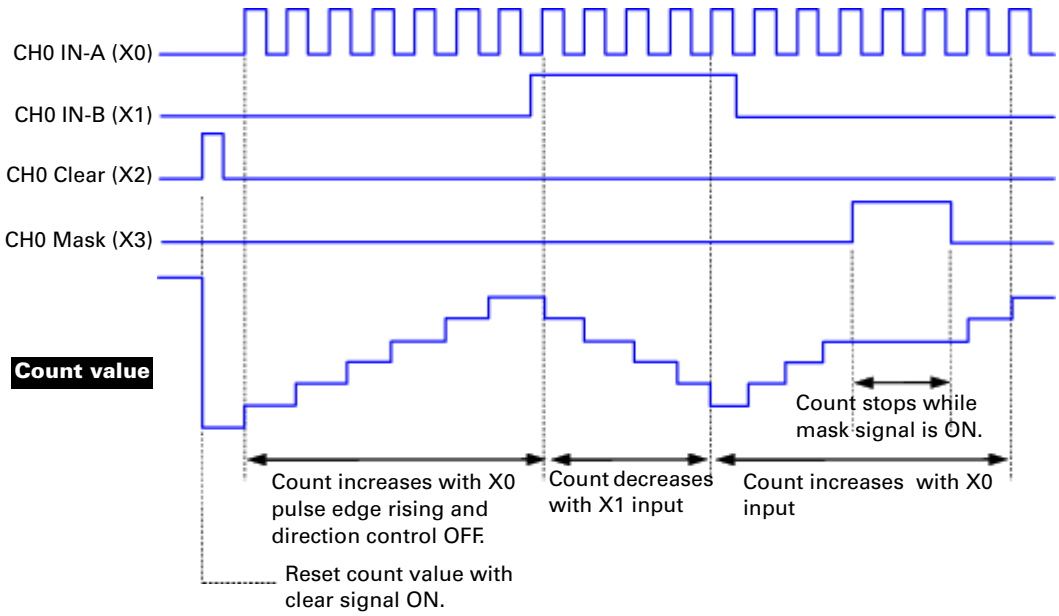


Input increase pulse in X0 and decrease pulse signal in X1 and measure the count number.

Counter current value is cleared with X2 clear instruction, and count operation is paused with X3 mask instruction.

Time Chart

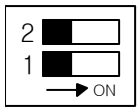
Count value changes according to the input status of each signal as illustrated below. Count value changes at the pulse input edge rise time.


CH0 IN-A (X0)
CH0 IN-B (X1)
CH0 Clear (X2)
CH0 Mask (X3)
Count value
Count stops while mask signal is ON.
Count increases with X0 pulse edge rising and direction control OFF.
Count decreases with X1 input
Count increases with X0 input
Reset count value with clear signal ON.

Mode Setting Switch Setting

Set to Mode A when counter function is in use without interrupt function.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.

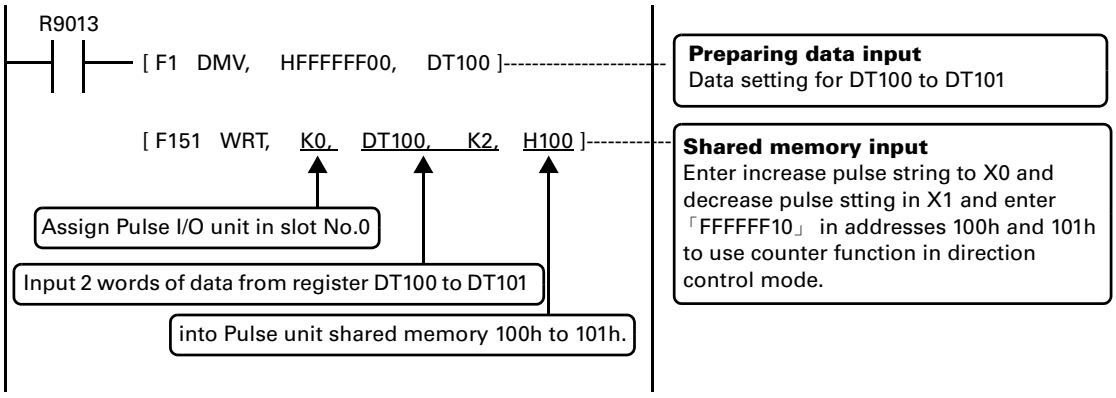
In the example, increase pulse string is input to X0 and decrease pulse setting to X1, and counter function is used in direction control mode. Enter 「FFFFFF10」 to shared memory addresses 100h and 101h.

Shared memory 100h, 101h settings

(bit) 32				16 15				0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Terminal Input

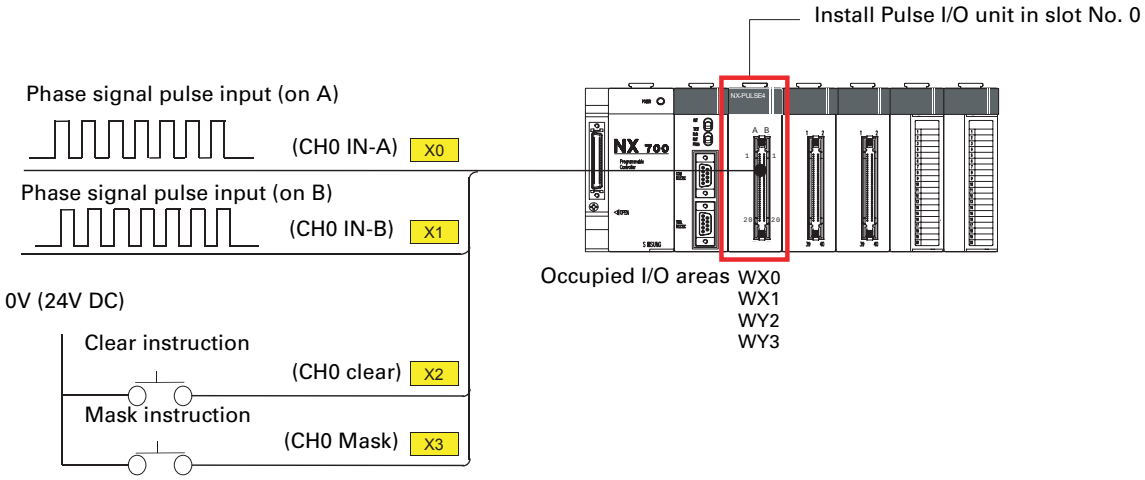
Sample Program

Enter 「FFFFFF10」 in shared memory address counter setting area (100h, 101h), and enter pulse string in X0, direction control in X1, and therefore set the counter function to direction control mode.


R9013
[F1 DMV, HFFFFFF00, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse unit shared memory 100h to 101h.
Preparing data input
Data setting for DT100 to DT101
Shared memory input
Enter increase pulse string to X0 and decrease pulse stting in X1 and enter 「FFFFFF10」 in addresses 100h and 101h to use counter function in direction control mode.

Count Function Available as Phase Input Mode

Overview



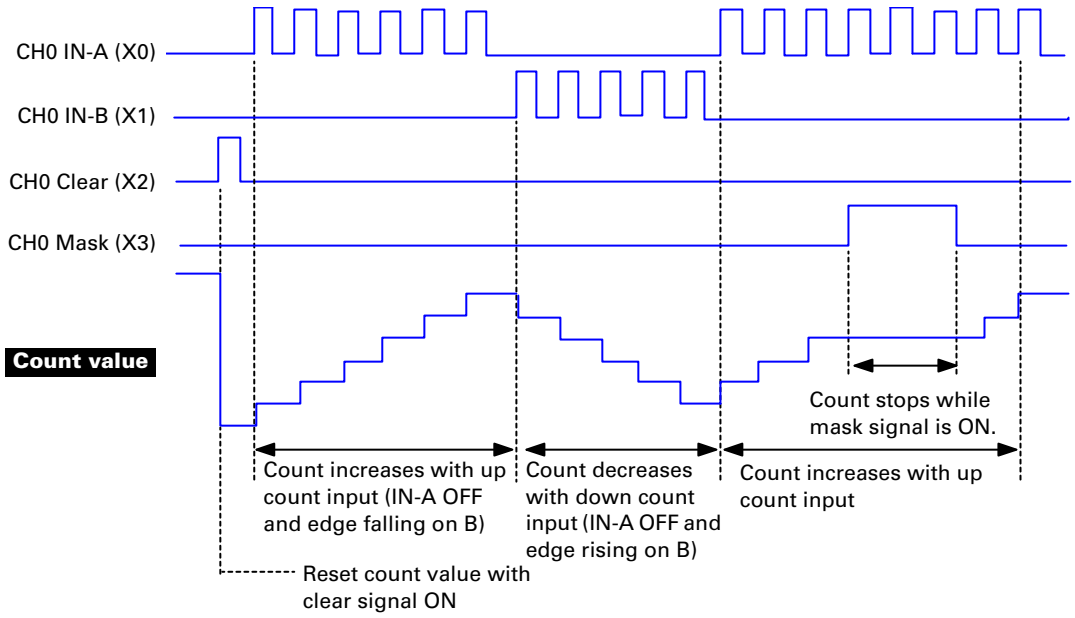
Phase signal from encoder is input to X0 and X1 and measures the count number.

Counter current value is cleared with X2 clear instruction, and count operation is paused with X3 mask instruction.

Time Chart

Count value changes according to the input status of each signal as illustrated below.

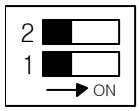
Count value increases with IN-A OFF and IN-B edge falling with 1 multiplication, and decreases with IN-A OFF and IN-B edge rising.


CH0 IN-A (X0)
CH0 IN-B (X1)
CH0 Clear (X2)
CH0 Mask (X3)
Count value
Count stops while mask signal is ON.
Count increases with up count input (IN-A OFF and edge falling on B)
Count decreases with down count input (IN-A OFF and edge rising on B)
Count increases with up count input
Reset count value with clear signal ON

Mode Setting Switch Setting

Set to Mode A when counter function is in use without interrupt function.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.

In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode, therefore, enter 「FFFFFF20」to shared memory addresses 100h and 101h.

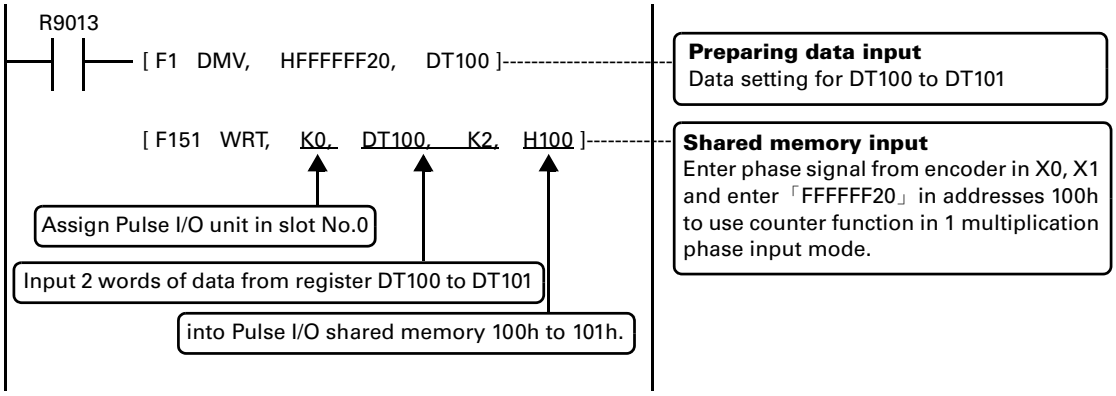
Shared memory 100h, 101h settings

(bit) 32 16 15 0

External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase Input	Terminal Input

Sample Program

Enter 「FFFFFF20」in shared memory address counter setting area (100h, 101h), and enter increase pulse string in X0, decrease pulse string in X1; therefore, set the counter function to individual input mode.


R9013
[F1 DMV, HFFFFFF20, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 100h to 101h.
Preparing data input
Data setting for DT100 to DT101
Shared memory input
Enter phase signal from encoder in X0, X1 and enter 「FFFFFF20」in addresses 100h to use counter function in 1 multiplication phase input mode.

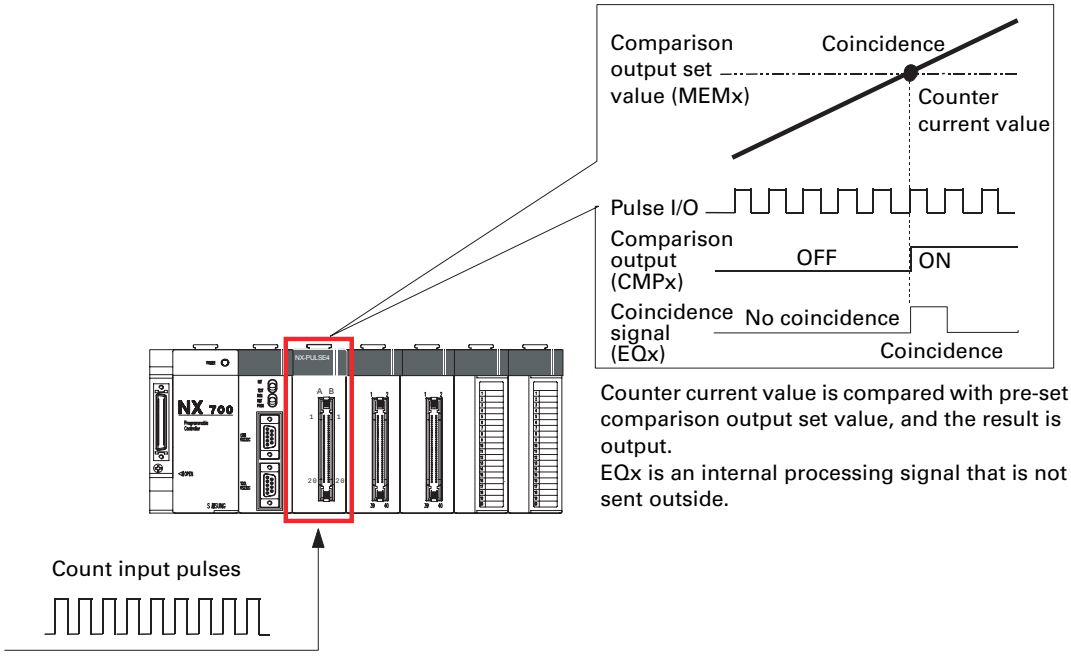
IMPORTANT In phase differential input mode, the input pulse magnification can be changed with multiplication function. See *"High-speed Counter Function" in Chapter 2* for details.

Comparison Output Function

Comparison Output Function

What is Comparison Output Function?

- Compare the comparison output set value and counter current value, and the comparison result is output.
  Comparison result output [CMPx]:
  Comparison output set value ≤Counter current value
- Comparison result output can be selected from either ON when current value < set value or current value ≥ set value.
- For Pulse I/O unit, 8 types of comparison output set values can be set, and the comparison counter channels can also be freely selected. Therefore, if all comparison output set values are set to a single counter, a maximum of 8 level comparisons are available.



Counter current value is compared with pre-set comparison output set value, and the result is output.
EQx is an internal processing signal that is not sent outside.

Setting Comparison Output Function

To use comparison output function, Step ①. Shared Memory Setting for Comparison Output Set Value and Step ②. Shared Memory Setting for Comparison Output Point are needed.

Step ①. Shared Memory Setting for Comparison Output Set Value

Set the comparison output set value to be compared with counter current value.

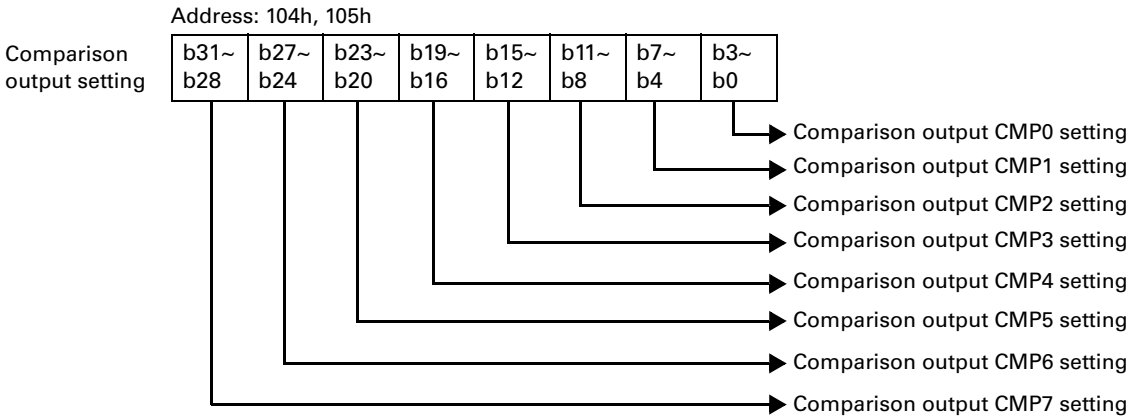
Comparison output set value (for CMP0)	MEM0	Address: 120h 121h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP1)	MEM1	Address: 122h 123h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP2)	MEM2	Address: 124h 125h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP3)	MEM3	Address: 126h 127h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP4)	MEM4	Address: 128h 129h K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP5)	MEM5	Address: 12Ah 12Bh K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP6)	MEM6	Address: 12Ch 12Dh K-2,147,483,648 to K+2,147,483,647
Comparison output set value (for CMP7)	MEM7	Address: 12Eh 12Fh K-2,147,483,648 to K+2,147,483,647

ATTENTION Make sure to access shared memory by 2 word unit.

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Step ②. Shared Memory Setting for Comparison Output Point

Select the counter channel number and output logic for each comparison output point.



Comparison Output Setting

Set value (HEX)	Functions		
	Comparison output function	Output logic	Counter CH to be compared
0	Used	ON when current value < set value	CH0
1			CH1
2			CH2
3			CH3
4		ON when current value ≥ set value	CH0
5			CH1
6			CH2
7			CH3
8	Invalid *1	Invalid *1	
9			
A			
B			
C			
D			
E			
F	Unused *2	-	

*1: Do not use this setting.

*2: Initial values on power input are set as unused.

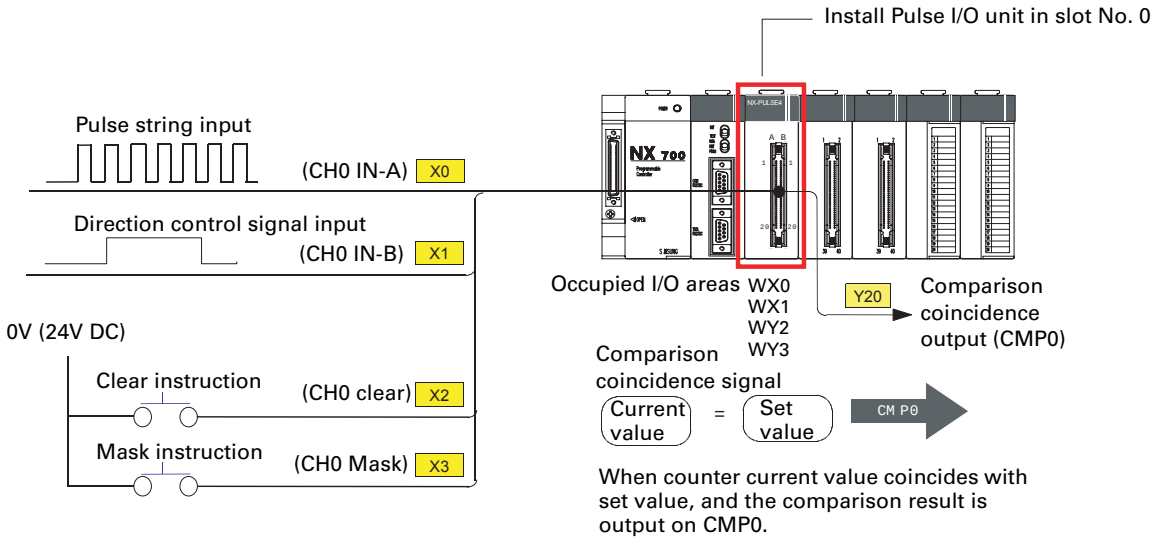
ATTENTION

- Make sure to access shared memory by 2 word unit.
- When using this setting regardless of counter function use setting (ON/OFF), be careful that comparison output set value and counter current value are compared.
- When setting the comparison output function, make sure to first set shared memory for Comparison Output Set Value. Otherwise, coincidence output is generated at the time of data setting if the comparison output condition is met, as in the case that counter initial value and comparison output set value are both 0.

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Comparison Output Function with Counter

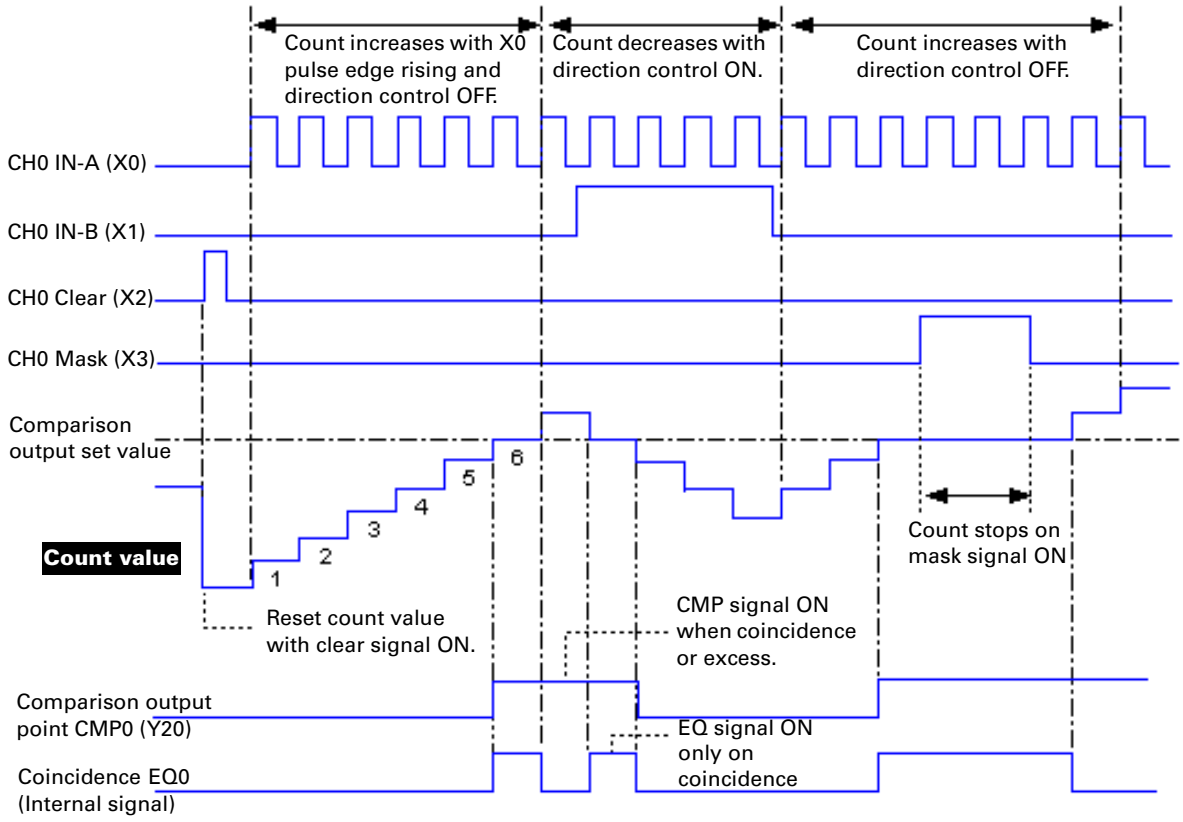
Overview



Counter current value is compared with pre-set comparison output set value, and the comparison result is output. This function is available in all counter operation modes, but in this example the counter is used in direction control mode.

Time Chart

Count value changes according to the input status of each signal as illustrated below.



Mode Setting Switch Setting

Set to Mode A when counter function is in use without interrupt function.

Mode A (SW1 →OFF, SW2 →OFF)

No interrupt function

Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter Setting

Setting the operation mode for each counter CH.

In the example, pulse string is input to X0 and direction control signal to X1, and counter function is used in direction control mode. Enter 「FFFFFF00」 to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction Control	Terminal Input

Setting the Comparison Output Set Value

Setting the comparison output set value to be compared with Counter current value. In the example, the comparison result is output on CMP0 when counter current value is 6. Enter 「K6(H6)」 in shared memory addresses 120h, 121h.

Shared Memory 120h, 121h Settings

(bit) 32					16 15			0
Setting item	Comparison output set value (CMP0)							
Set value	0	0	0	0	0	0	0	6
Settings	K6							

Setting the Comparison Output Point

Select the counter channel number and output logic for each comparison output point.

In the example, counter current value at CH0 is compared with comparison output set value and the comparison result is output on CMP0. Therefore, enter 「FFFFFFF4」in shared memory addresses 104h and 105h.

Shared Memory 104h, 105h Settings

(bit) 32				16	15			0
Comparison input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	F	4
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	CH0 Comparison *

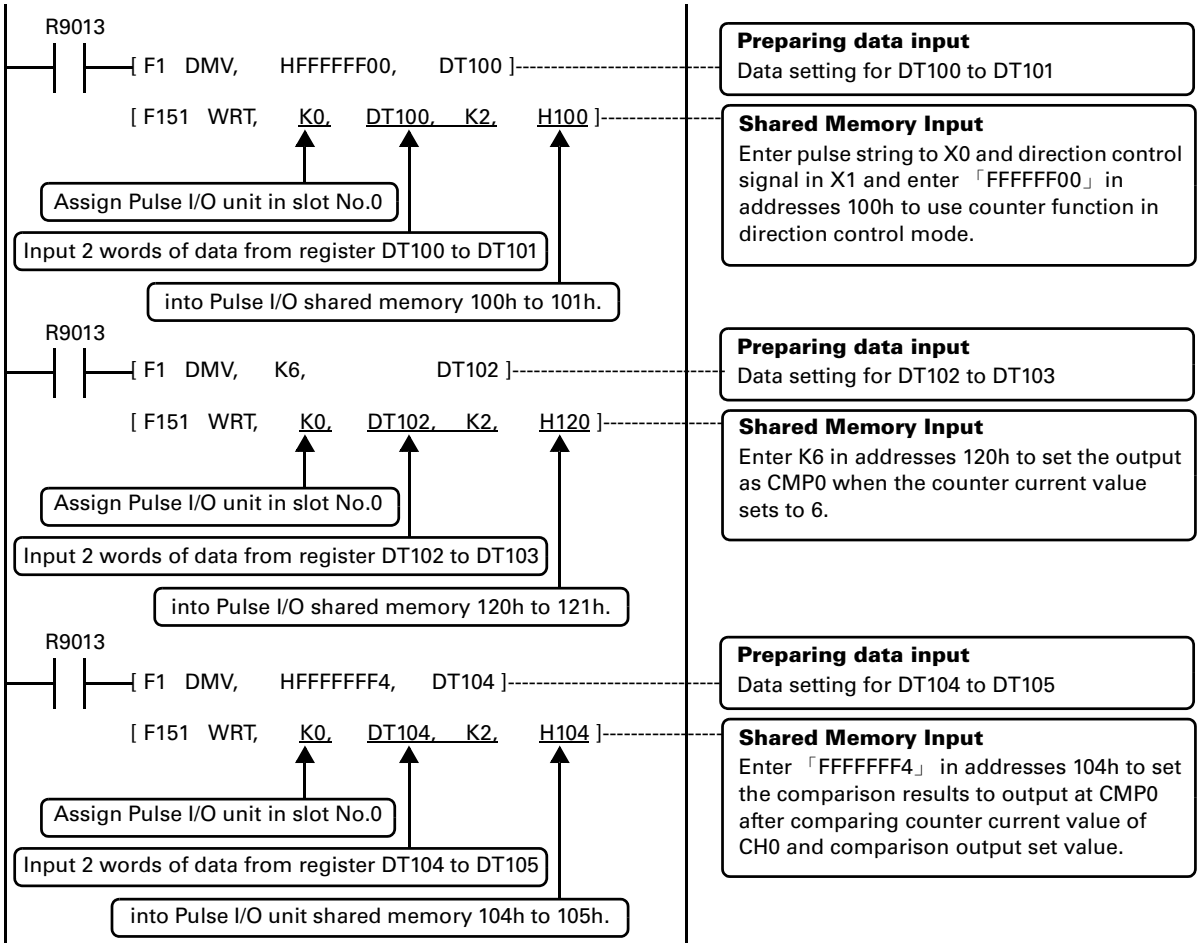
* CMP0 is ON when current value ≥ set value

ATTENTION

When setting the comparison output function, make sure to first set shared memory for Comparison Output Set Value. Otherwise, coincidence output is generated at the time of data setting if the comparison output condition is met, as in the case that counter initial value and comparison output set value are both 0.

Sample Program

Setting counter mode setting, comparison output functions in shared memory.


R9013
[F1 DMV, HFFFFFF00, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 100h to 101h.
Preparing data input
Data setting for DT100 to DT101
Shared Memory Input
Enter pulse string to X0 and direction control signal in X1 and enter 「FFFFFF00」in addresses 100h to use counter function in direction control mode.
R9013
[F1 DMV, K6, DT102]
[F151 WRT, K0, DT102, K2, H120]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT102 to DT103
into Pulse I/O shared memory 120h to 121h.
Preparing data input
Data setting for DT102 to DT103
Shared Memory Input
Enter K6 in addresses 120h to set the output as CMP0 when the counter current value sets to 6.
R9013
[F1 DMV, HFFFFFFF4, DT104]
[F151 WRT, K0, DT104, K2, H104]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT104 to DT105
into Pulse I/O unit shared memory 104h to 105h.
Preparing data input
Data setting for DT104 to DT105
Shared Memory Input
Enter 「FFFFFFF4」 in addresses 104h to set the comparison results to output at CMP0 after comparing counter current value of CH0 and comparison output set value.

Interrupt Function

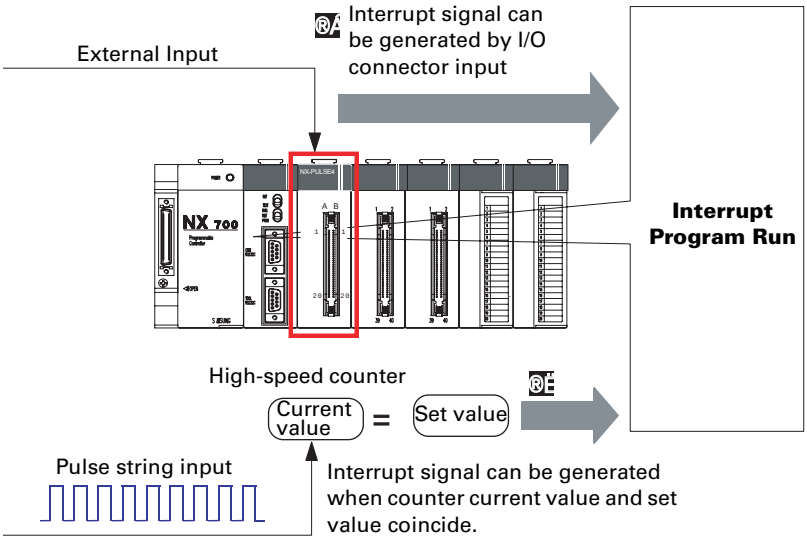
Interrupt Function

What is Interrupt Function?

- This function runs pre-set interrupt program based on the interrupt signals generated at pulse I/O unit.
- Pulse I/O unit can be used either as interrupt unit with 8 point interrupt or as interrupt generation high-performance unit with 1 point interrupt.
- Pulse I/O unit enables user to select the connection point (condition) that generates interrupt signal.

① Interrupt signal generation by I/O connector input

② Interrupt signal generation by coincidence of counter current value and comparison output set value



ATTENTION

Interrupt output by counter coincidence is generated when the current value and comparison output set value coincide, regardless of up or down count.

Setting Interrupt Function

To use interrupt function, Step ①. Mode Setting Switch Setting and Step ② Shared Memory Setting are needed. Mode setting switch settings become effective on power input.

Step ① Mode Setting Switch Setting

Mode setting switch is needed for interrupt function.

Select one of the following, according to the *"Mode Setting Switch Setting" in Chapter 2*.

Mode B (SW1 →ON, SW2 →OFF)

Interrupt function (8 interrupt points)

- Max. 8 interrupt points are available per one unit. (INT0 to INT7)
- In this mode, the unit is automatically set to 8 interrupt points (INT0 to INT7) regardless of interrupt functions use (ON/OFF).

Mode C (SW1 →OFF, SW2 →ON)

Interrupt generation special unit (1 interrupt point)

- Only one valid interrupt per one unit. (INT0 *1)
- INT1 to INT7 are invalid regardless of interrupt settings.

*1: INT0 indicates the interrupt location on the unit. Numbers of interrupt programs that can be set by the program are INT16 to

IMPORTANT **Interrupt functions available and interrupt generation special unit**

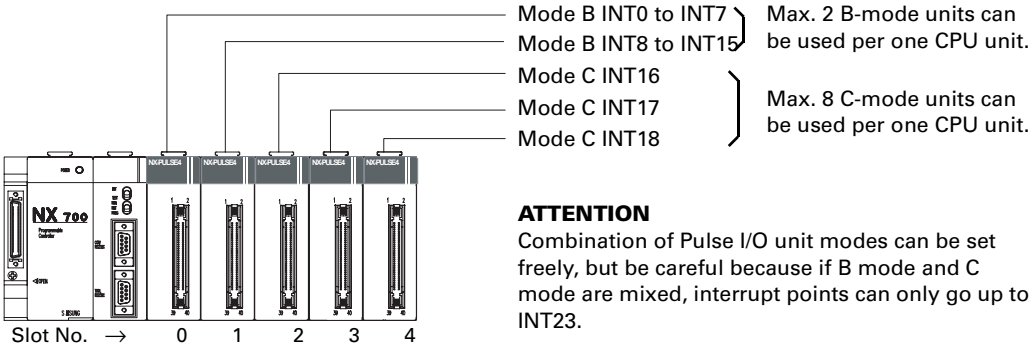
Interrupt functions available

- Pulse I/O unit set to mode B is used as interrupt unit and provides 8 interrupts per each unit.
- Be careful because only two mode B units can be used for one CPU unit.

Interrupt generation special unit

- Pulse I/O unit set to mode C is used as interrupt generation special unit and provides 1 interrupt per each unit.
- Be careful because only 8 interrupt generation special units can be used per one CPU unit.

Interrupt functions with multiple Pulse I/O units

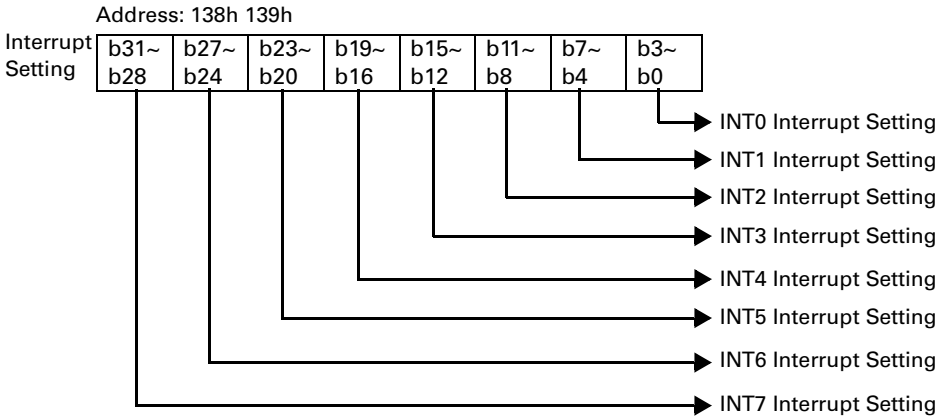


ATTENTION

Combination of Pulse I/O unit modes can be set freely, but be careful because if B mode and C mode are mixed, interrupt points can only go up to INT23.

Step ② Shared Memory Setting

Shared memory setting is needed along with mode switch setting.
Set interrupt function mode according to the table below.



Set value (HEX)	Functions		
	Interrupt function	Connection point	Interrupt condition
0	Used	Comparison output function *1 (CMP0 to CMP7)	Coincidence output
1			
2		Input terminal (X8 to XF)	off →on
3			on →off *2
4	Invalid *3	Invalid *3	Invalid *3
5			
6			
7			
8			
9			
A			
B			
C			
D			
E			
F	Unused *4	-	-

*1: Each of INT0 to INT7 corresponds to each of CMP0 to CMP7.

<Ex> When Set Value 1 is selected for INT0 interrupt setting, interrupt generates on coincidence output (EQ0) at CMP0

*2: Make sure to run interrupt clear instruction after this setting.

*3: Do not set the set value of H4 to HE

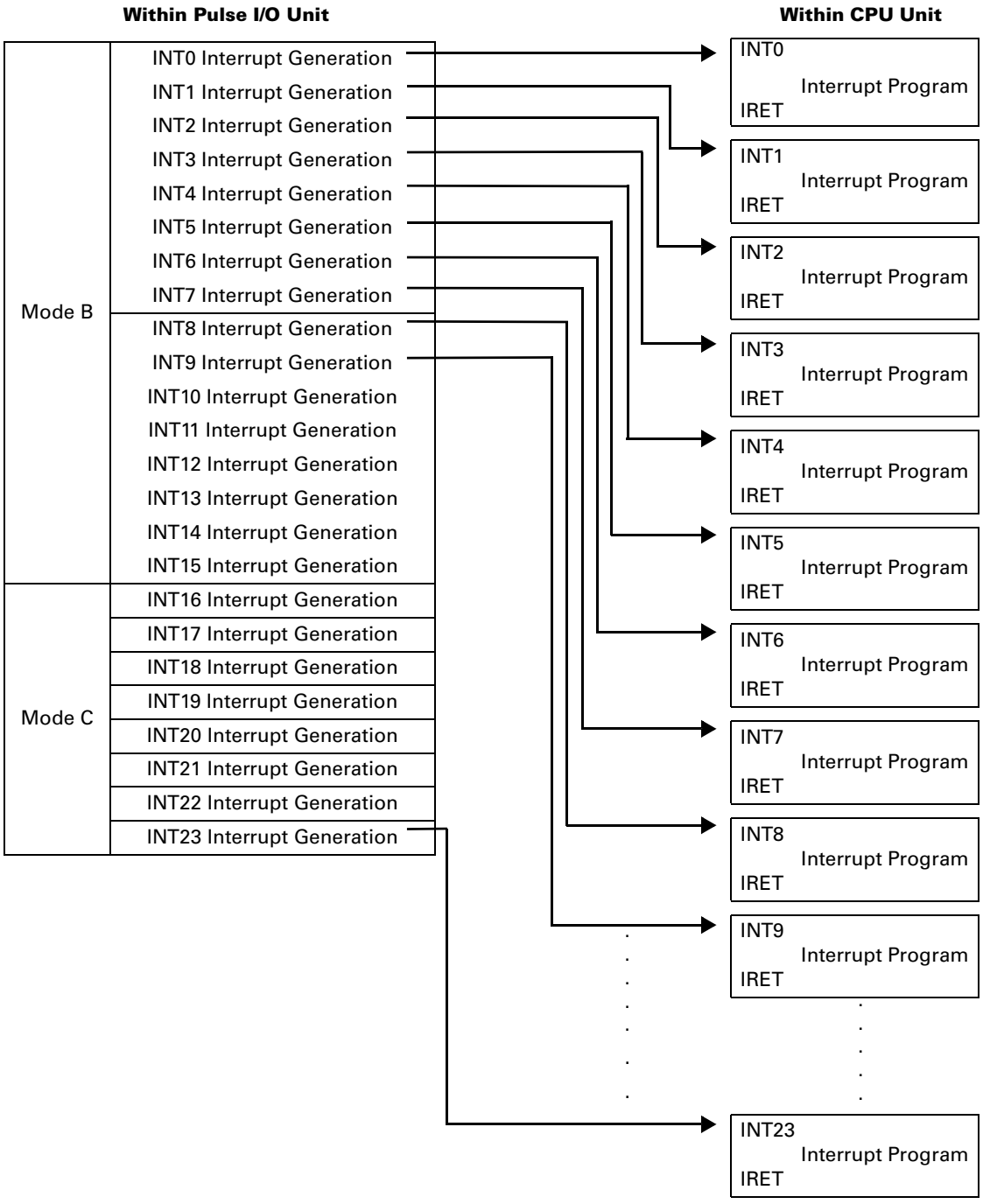
*4: Initial value on power input is set to unused.

ATTENTION Make sure to access shared memory by 2 word unit.

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Relations Between Interrupt Input Number and Interrupt Program

Pulse I/O unit interrupt and interrupt program of sequence program run in connection with each other.
When interrupt is generated at unit INT0 as shown below, the interrupt programs of INT0 to IRET of sequence program boot up.

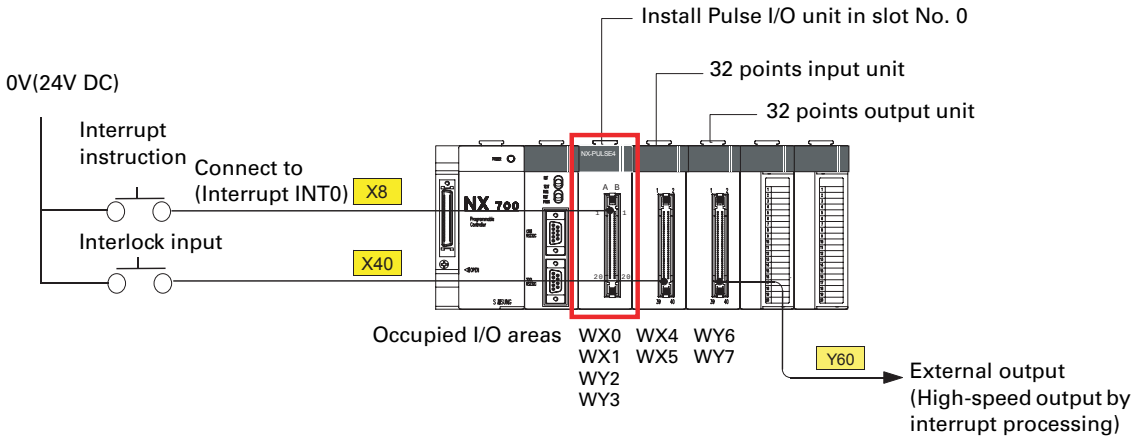


When set to mode C, the assignable interrupt program numbers for sequence program are INT 16 to 23.

NOTE See *"Programming II manual"* for detailed description of interrupt programs.

Interrupt Functions (External Input)

Overview

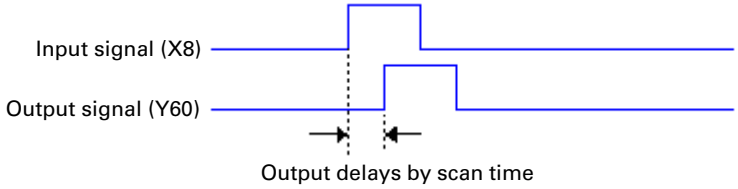


When X8 interrupt (INTO) is entered with interlock X40 input, the Y60 output is sent out at high-speed due to interrupt processing.

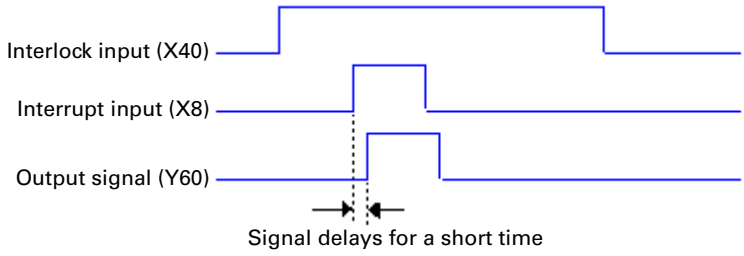
Time Chart

In general processing without interrupt, the time between input and signal output is affected by scan time. But if interrupt is processed, the input status is not affected by scan time but delays signal for a short time.

General Processing



Interrupt Processing



Mode Setting Switch Setting

In this example, set the switch to mode B where max. 8 interrupt points of INT0 to INT7 are available. If only one point is needed per unit, set to mode C. Be careful because in mode C, signal will set to INT 16.

Mode B (SW1 →ON, SW2 →OFF)

Interrupt function (8 interrupt points)

- Max. 8 interrupt points are available per one unit. (INT0 to INT7)
- In this mode, the unit is automatically set to 8 interrupt points unit regardless of interrupt function use settings (ON/OFF).

Mode C (SW1 →OFF, SW2 →ON)

Interrupt generation special unit (1 interrupt point)

- Only one valid interrupt per one unit. (INT0 *1)
- INT1 to INT7 are invalid regardless of interrupt settings.

*1: INT0 indicates the interrupt location on the unit. Numbers of interrupt programs that can be set by the sequence program are INT16 to INT23.

Shared Memory Setting

Interrupt Setting

When using interrupt function, shared memory setting is needed as well the setting of mode setting switch on the bottom of the unit. In the example, the external input at X8 generates interrupt signal on edge rising (off →on), so enter 「FFFFFFF2」 in shared memory addresses 138h and 139h.

Shared Memory 138h, 139h Settings

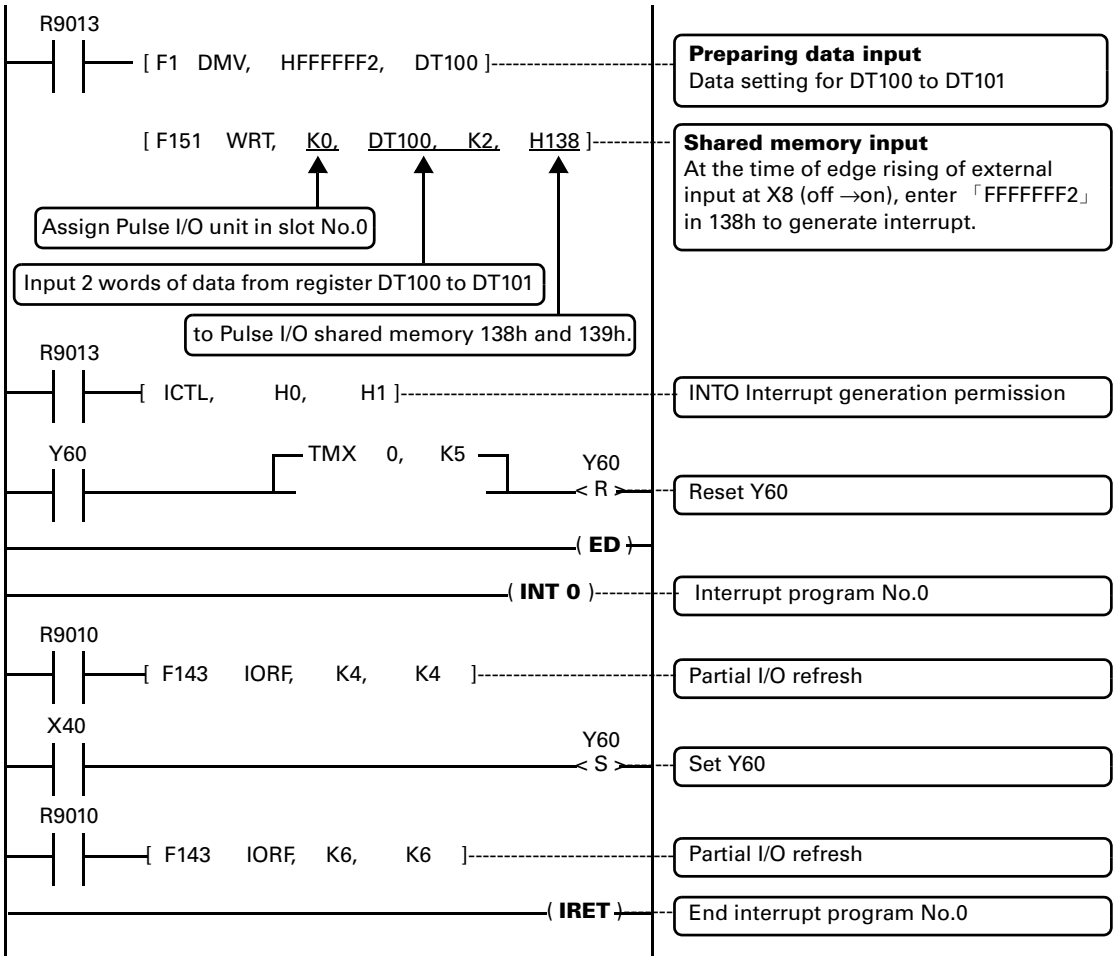
(bit) 32				16 15				0
External input	XF	XE	XD	XC	XB	XA	X9	X8
Counter number	INT7	INT6	INT5	INT4	INT3	INT2	INT1	INT0
Set value	F	F	F	F	F	F	F	2
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	off →on

Sample Program

Enter 「FFFFFFFF2」 into the area of interrupt setting (138h, 139h) in shared memory addresses, and set the interrupt at external input (off →on) of X8.

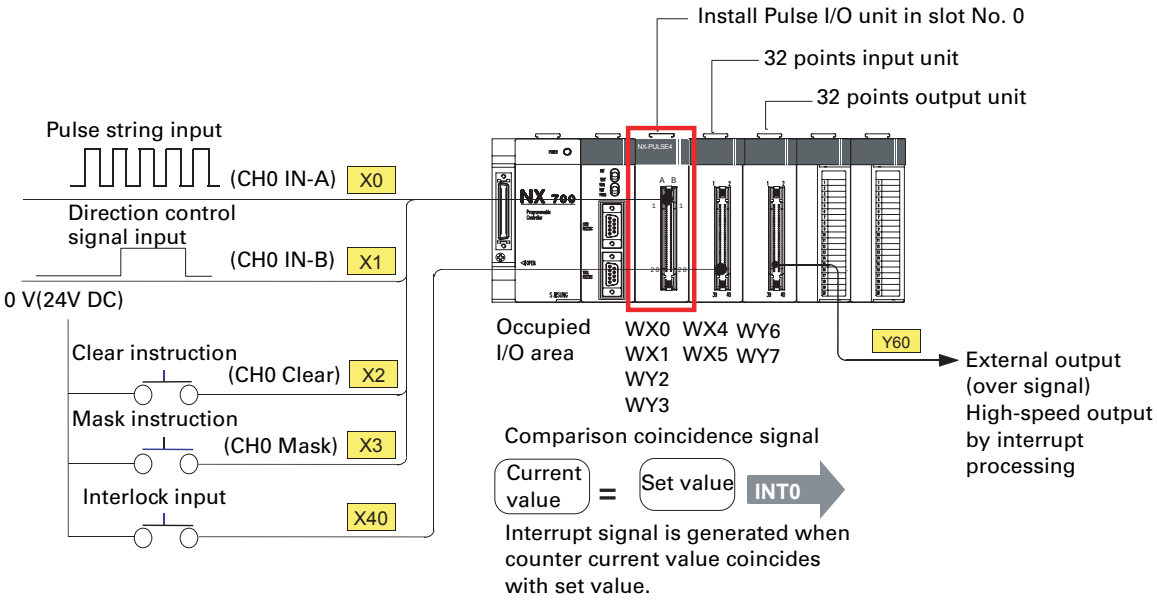
Describing programs to be run by interrupts following end instruction and permissions to interrupts before end instruction.

- This program is an example when the Pulse I/O unit is installed in slot 0.


R9013
[F1 DMV, HFFFFFF2, DT100]
Preparing data input
Data setting for DT100 to DT101
[F151 WRT, K0, DT100, K2, H138]
Shared memory input
At the time of edge rising of external input at X8 (off →on), enter 「FFFFFFF2」 in 138h to generate interrupt.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
to Pulse I/O shared memory 138h and 139h.
R9013
[ICTL, H0, H1]
INTO Interrupt generation permission
Y60
TMX 0, K5
Y60
< R >
Reset Y60
(ED)
(INT 0)
Interrupt program No.0
R9010
[F143 IORF, K4, K4]
Partial I/O refresh
X40
Y60
< S >
Set Y60
R9010
[F143 IORF, K6, K6]
Partial I/O refresh
(IRET)
End interrupt program No.0

Interrupt Functions (Comparison Coincidence Signal)

Overview

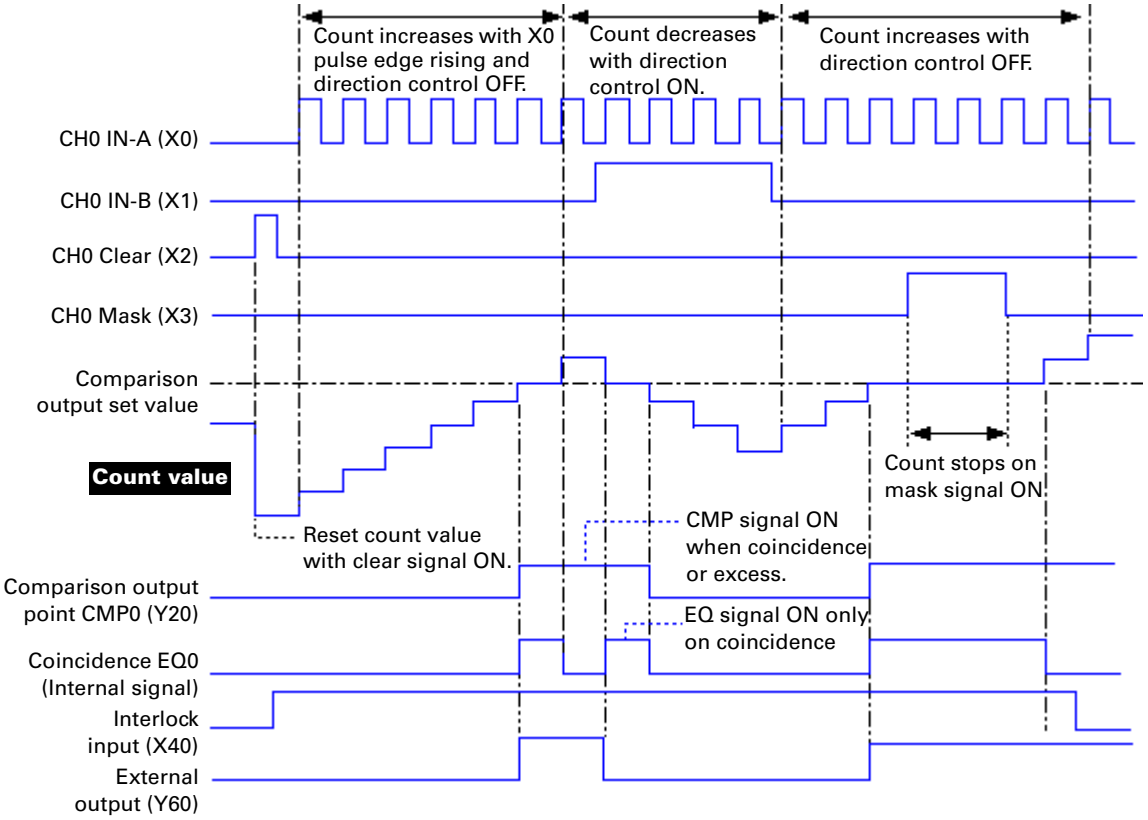


Input pulse string in X0 and direction control signal in X1 and measure the count number. If the counted pulse number reaches (exceeds) the pre-settled comparison output set value, interrupt is generated at INT0. When INT0 is generated, allocated programs from sequence program INT0 to IRET start, and Y60 output is sent out at a high speed.

NOTE For comparison functions, See *"Comparison Output Function" in Chapter 7*.

Time Chart

Count value and output change according to the input status of each signal as illustrated below.

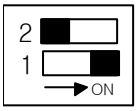

Count increases with X0 pulse edge rising and direction control OFF.
Count decreases with direction control ON.
Count increases with direction control OFF.
CH0 IN-A (X0)
CH0 IN-B (X1)
CH0 Clear (X2)
CH0 Mask (X3)
Comparison output set value
Count value
Count stops on mask signal ON.
Reset count value with clear signal ON.
CMP signal ON when coincidence or excess.
Comparison output point CMP0 (Y20)
EQ signal ON only on coincidence
Coincidence EQ0 (Internal signal)
Interlock input (X40)
External output (Y60)

NOTE For signals such as clear and mask, See *"Setting Counter Function" in Chapter 6*.

Mode Setting Switch Setting

In this example, set the switch to mode B where max. 8 interrupt points of INT0 to INT7 are available. If only one point is needed per unit set to mode C. But in mode C, signal will set to INT 16.

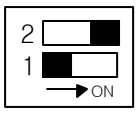
Mode B (SW1 →ON, SW2 →OFF)



Interrupt function (8 interrupt points)

- Max. 8 interrupt points are available per one unit. (INT0 to INT7)
- In this mode, 8 interrupt points (INT0 to INT7) are automatically set regardless of ON/OFF setting of interrupt function.

Mode C (SW1 →OFF, SW2 →ON)



Interrupt generation special unit (1 interrupt point)

- Only one valid interrupt per one unit. (INT0 *1)
- INT1 to INT7 are invalid regardless of interrupt settings.

*1: INT0 indicates the interrupt location on the unit. Interrupt program numbers INT 16 to 23 are available for sequence program setting.

Shared Memory Setting

Interrupt setting

When using interrupt function, shared memory setting is needed as well as setting of the mode setting switch on the bottom of the unit. In this example, comparison output function generates INT0 interrupt at CMP0. Enter「FFFFFFF1」in shared memory addresses 138h and 139h.

Shared Memory 138h, 139h Settings

(bit) 32	16	15	0

Counter number	INT7	INT6	INT5	INT4	INT3	INT2	INT1	INT0
Set value	F	F	F	F	F	F	F	1
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	CMP0

Counter Setting

Setting the operation mode for each counter CH.

In the example, pulse string is input to X0 and direction control signal to X1, and counter function is used in direction control mode. Enter「FFFFFF00」to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32	16	15	0

External input	X7	X6	X5	X4	X3	X2	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Used

Setting the comparison output set value

Setting the comparison output set value to be compared with counter current value.
In the example, the comparison result is output on CMP0 when counter current value is 6. Enter「K6(H6)」in shared memory addresses 120h, 121h.

Shared Memory 120h, 121h Settings

(bit) 32	16	15	0

Setting item	Comparison output set value (CMP0)							
Set value	0	0	0	0	0	0	0	6
Settings	K6							

Setting the Comparison Output Point

Select the counter channel number and output logic for each comparison output point.
In the example, counter current value at CH0 is compared with comparison output set value and the result is output. Therefore, enter 「FFFFFFF0」 in shared memory addresses 104h and 105h.

Shared Memory 104h, 105h Settings

(bit) 32					16	15			0
Comparison input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	F	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Comparision CMPO *

* CMPO is ON when current value ≥ set value

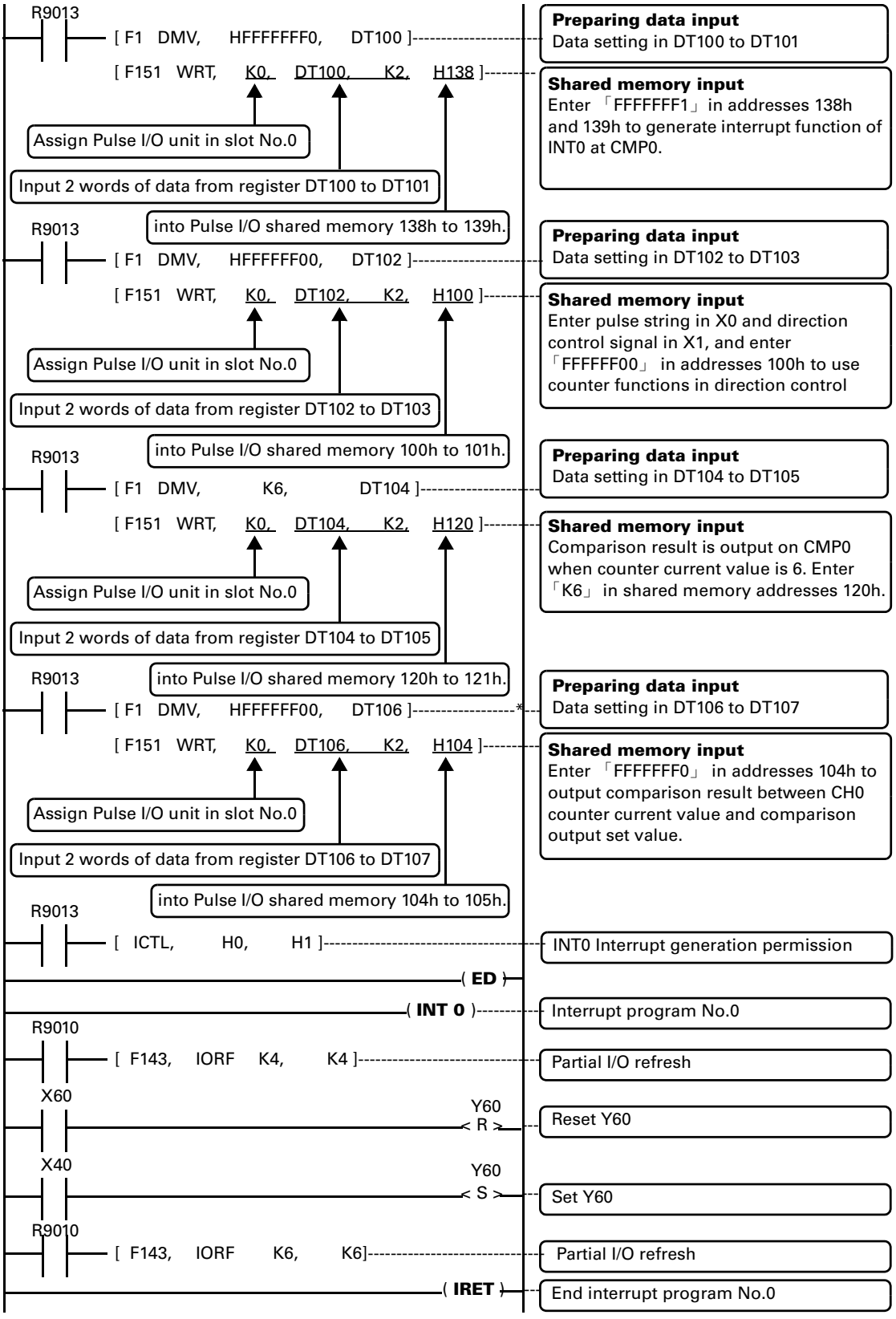
ATTENTION

When setting the comparison output function, make sure to first set shared memory for Comparison Output Set Value. Otherwise, coincidence output is generated at the time of data setting if the comparison output condition is met, as in the case when counter initial value and comparison output set value are both 0.

Sample Program

Setting interrupt settings and counter mode settings and comparison output functions in shared memory.
Describing programs to be run by interrupts following end instruction.

➡ This program is an example when the Pulse I/O unit is installed in slot 0.


R9013
[F1 DMV, HFFFFFFF0, DT100]
Preparing data input
Data setting in DT100 to DT101
[F151 WRT, K0, DT100, K2, H138]
Shared memory input
Enter 「FFFFFFF1」 in addresses 138h and 139h to generate interrupt function of INT0 at CMP0.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 138h to 139h.
R9013
[F1 DMV, HFFFFFF00, DT102]
Preparing data input
Data setting in DT102 to DT103
[F151 WRT, K0, DT102, K2, H100]
Shared memory input
Enter pulse string in X0 and direction control signal in X1, and enter 「FFFFFF00」 in addresses 100h to use counter functions in direction control
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT102 to DT103
into Pulse I/O shared memory 100h to 101h.
R9013
[F1 DMV, K6, DT104]
Preparing data input
Data setting in DT104 to DT105
[F151 WRT, K0, DT104, K2, H120]
Shared memory input
Comparison result is output on CMP0 when counter current value is 6. Enter 「K6」 in shared memory addresses 120h.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT104 to DT105
into Pulse I/O shared memory 120h to 121h.
R9013
[F1 DMV, HFFFFFF00, DT106]*
Preparing data input
Data setting in DT106 to DT107
[F151 WRT, K0, DT106, K2, H104]
Shared memory input
Enter 「FFFFFFF0」 in addresses 104h to output comparison result between CH0 counter current value and comparison output set value.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT106 to DT107
into Pulse I/O shared memory 104h to 105h.
R9013
[ICTL, H0, H1]
INT0 Interrupt generation permission
(ED)
(INT 0)
Interrupt program No.0
R9010
[F143, IORF K4, K4]
Partial I/O refresh
X60
Y60
< R >
Reset Y60
X40
Y60
< S >
Set Y60
R9010
[F143, IORF K6, K6]
Partial I/O refresh
(IRET)
End interrupt program No.0

Pulse Output Function

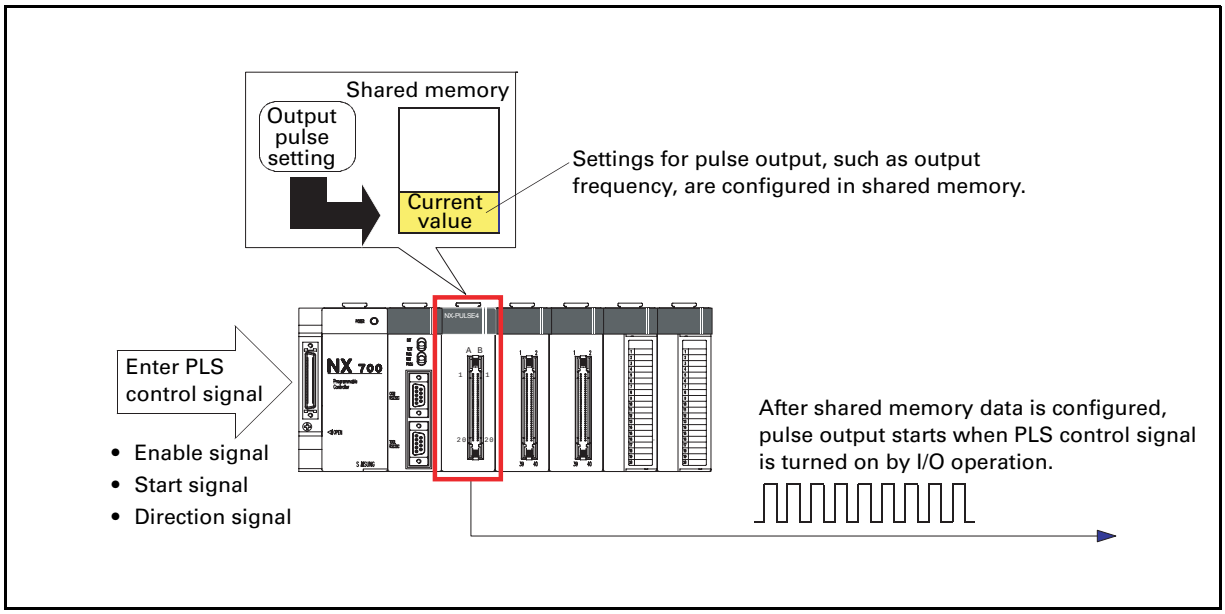
Pulse Output Function

What is Pulse Output Function?

- Pulse output function sends out waves at a frequency randomly selected from 1 Hz to 100 kHz range.
  Setting unit is 1 Hz.
- There are two output modes as follows:

  1) Direction control

  2) Individual output
- In addition, Pulse I/O unit provides up to 4CH for pulse output.
  But user must choose between pulse output and PWM output, so if PWM is selected, the number of channels for pulse output is decreased.


Shared memory
Output pulse setting
Current value
Settings for pulse output, such as output frequency, are configured in shared memory.
Enter PLS control signal
Enable signal
Start signal
Direction signal
NX 700
After shared memory data is configured, pulse output starts when PLS control signal is turned on by I/O operation.

ATTENTION

Pulse output (pulse, PWM) consists of 4CH as described below.

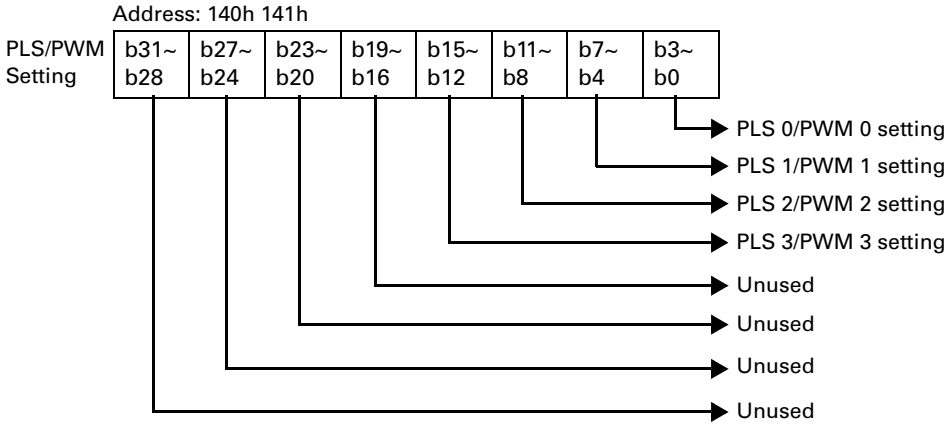
- CH 0: PLS0 output or PWM0 output
- CH 1: PLS1 output or PWM1 output
- CH 2: PLS2 output or PWM2 output
- CH 3: PLS3 output or PWM3 output

Setting Pulse output Function

- To use pulse output function, Step ① Shared memory PLS/PWM setting and Step ② Shared memory PLS/PWM frequency setting are needed.
- Beside shared memory setting, Enable start and direction signals are needed to be controlled with PLS control signal.

Step ①. Shared memory setting (PLS/PWM setting)

Set PWM output form by shared memory PLS/PWM settings.
The Same settings apply when PWM output is selected by pulse function.



Pulse output setting (PWM, PLS)

Set value (HEX)	Functions		
	Pulse function	Data change timing	Output mode
0	PWM	Refresh on edge rise of PLSx start signal	-
1		Edge rise of PLSx start signal, or comparison output	
2		Edge rise of PLSx start signal, or data refresh	
3		Reserved area	
4	PLS	Refresh on edge rise of PLSx start signal	Direction control
5			Individual output
6		Edge rise of PLSx start signal, or comparison output	Direction control
7			Individual output
8		Edge rise of PLSx start signal, or data refresh	Direction control
9			Individual output
A	Invalid * 1	Invalid * 1	Invalid * 1
B			
C			
D			
E			
F	Not used * 2	-	-

*1: Do not use this setting.

*2: Initial value on power input is set to unused.

ATTENTION Make sure to access shared memory by 2 word unit.

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Step ② Shared memory setting (PLS/PWM frequency setting)

- Configure frequency of output pulses after PLS/PWM setting of shared memory.
- Frequency is set within the range of 1 Hz to 100 kHz by 1 Hz unit. Output turns OFF (pulse stop) when frequency setting exceeds 131.072 kHz.
- When frequency is set to 0 Hz and data is refreshed, pulse output is stopped.

PLS 0/PWM 0 frequency setting	Address: 148h 149h	PLS: K1 to K100000
PLS 1/PWM 1 frequency setting	Address: 14Ah, 14Bh	PLS: K1 to K100000
PLS 2/PWM 2 frequency setting	Address: 14Ch 14Dh	PLS: K1 to K100000
PLS 3/PWM 3 frequency setting	Address: 14Eh 14Fh	PLS: K1 to K100000

ATTENTION

- Make sure to access shared memory by 2 word unit.
- On shared memory, PLS/PWM frequency setting should be located after PLS/PWM setting.
  If not, it may not work properly.
- Do not set a value out of the permitted range. It may cause errors.
- Error detection upper limit of the unit is 1048.575 kHz. (1048.575 kHz = FFFFFh)
  When setting exceeds the limit, the value based on the lower 20-bit is applied.

NOTE
- PLS/PWM flag is prepared at shared memory addresses 142h and 143h. Pulse output can be monitored by reading the flag in these addresses. See *"PLS/PWM Flag" in Chapter 1* for details.
- See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Step ③ PLS control signal

➡ Beside PLS/PWM setting, Enable, start and direction signals are needed to be controlled by PLS control signal.

Enable signal

→Enable signal determines valid/stop of pulse output.

ON: Pulse output valid
OFF: Pulse output stop

Start signal

→Start signal starts up pulse output, or change output frequency. Frequency can also be changed at the time of comparison coincidence or data refresh, by **Pulse output setting** configuration. Start signal is valid only when Enable signal is ON. If not, start signal is invalid. When both Enable and Start signals are ON, pulse output is permitted.

Direction signal

→Direction signal controls the direction of pulse output.

OFF: Forward
ON: Reverse

Direction signal	Direction control output	Individual output
OFF (Forward)	Pulse output from PLSx A PLSx B OFF	Pulse output from PLSx A PLSx B OFF
ON (Reverse)	Pulse output from PLSx A PLSx B ON	Pulse output from PLSx B PLSx A OFF

➡ Output allocation for each control signal is shown in the table below.

Control signal allocation table

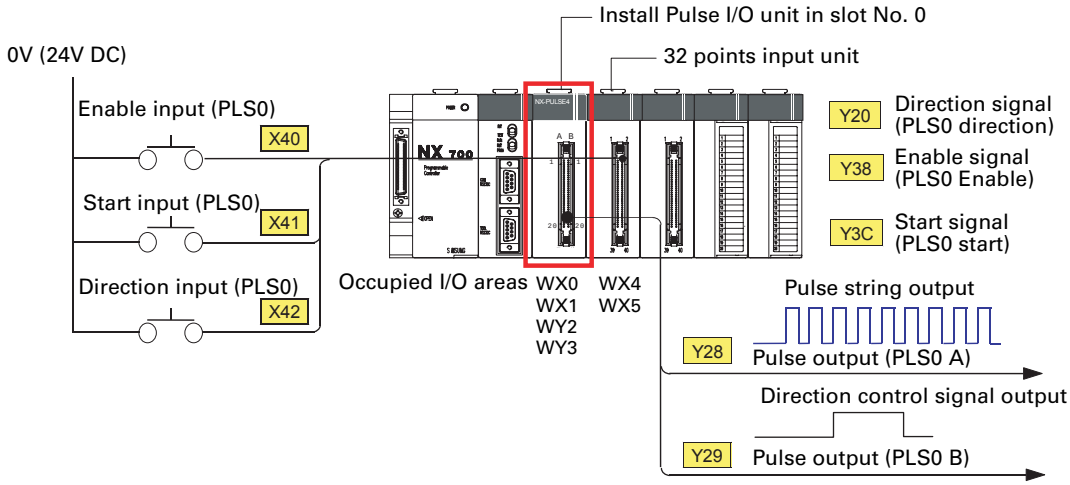
Output	Functions		
Allocation	Pulse output CH	Control events	Remarks
Y20	PLS0	Direction control	OFF: Forward Direction control output: PLSx B OFF Individual output: Pulse output from PLSx A ON: Reverse Direction control output: PLSx B ON Individual output: Pulse output from PLSx B
Y21	PLS1		
Y22	PLS2		
Y23	PLS3		
Y38	PLS0	Enable control	OFF: Pulse output stop ON: Pulse output valid
Y39	PLS1		
Y3A	PLS2		
Y3B	PLS3		
Y3C	PLS0	Start control	First ON: Pulse output start OFF →ON edge: Output pulse frequency changed
Y3D	PLS1		
Y3E	PLS2		
Y3F	PLS3		

ATTENTION

Direction signal can be changed even during pulse output, but timing with pulse output cannot be specified. Change the signal when pulse is stopped.

Use Pulse Output Function

Overview



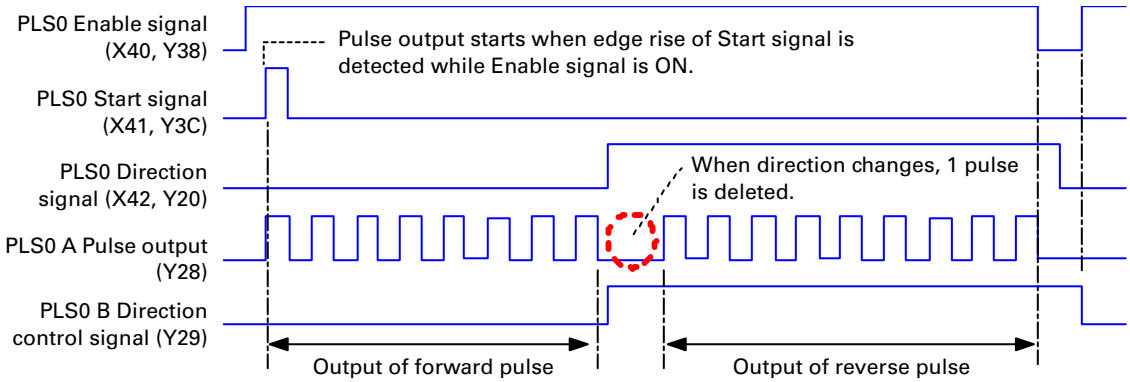
Sending pulse output in direction control mode.

Turn ON Enable input at X40 and Start input. Pulse output starts at Y28 and Y29 (PLS0).

When direction input at X42 is ON, pulse changes to reverse direction.

Time Chart

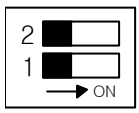
Pulse output changes in reference to the input status of each signal as illustrated below.


PLS0 Enable signal (X40, Y38)
Pulse output starts when edge rise of Start signal is detected while Enable signal is ON.
PLS0 Start signal (X41, Y3C)
PLS0 Direction signal (X42, Y20)
When direction changes, 1 pulse is deleted.
PLS0 A Pulse output (Y28)
PLS0 B Direction control signal (Y29)
Output of forward pulse
Output of reverse pulse

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

* Pulse output function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

PLS/PWM setting

Setting the Pulse output mode for PLS/PWM setting.

In this example, enter「FFFFFFF8」into shared memory addresses 140h and 141h, because in data refreshing direction control mode, pulse output starts from Y28 and Y29 (PLS0) when PLSx Start signal edge rises or data is refreshing.

Shared memory 140h, 141h settings

(bit) 32				16	15			0
Output number	Unused	Unused	Unused	Unused	PLS3	PLS2	PLS1	PLS0
Setting item	Unused	Unused	Unused	Unused	Form setting	Form setting	Form setting	Form setting
Set value	F	F	F	F	F	F	F	4
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	Data refresh with Start signal (Direction control)

PLS/PWM frequency setting

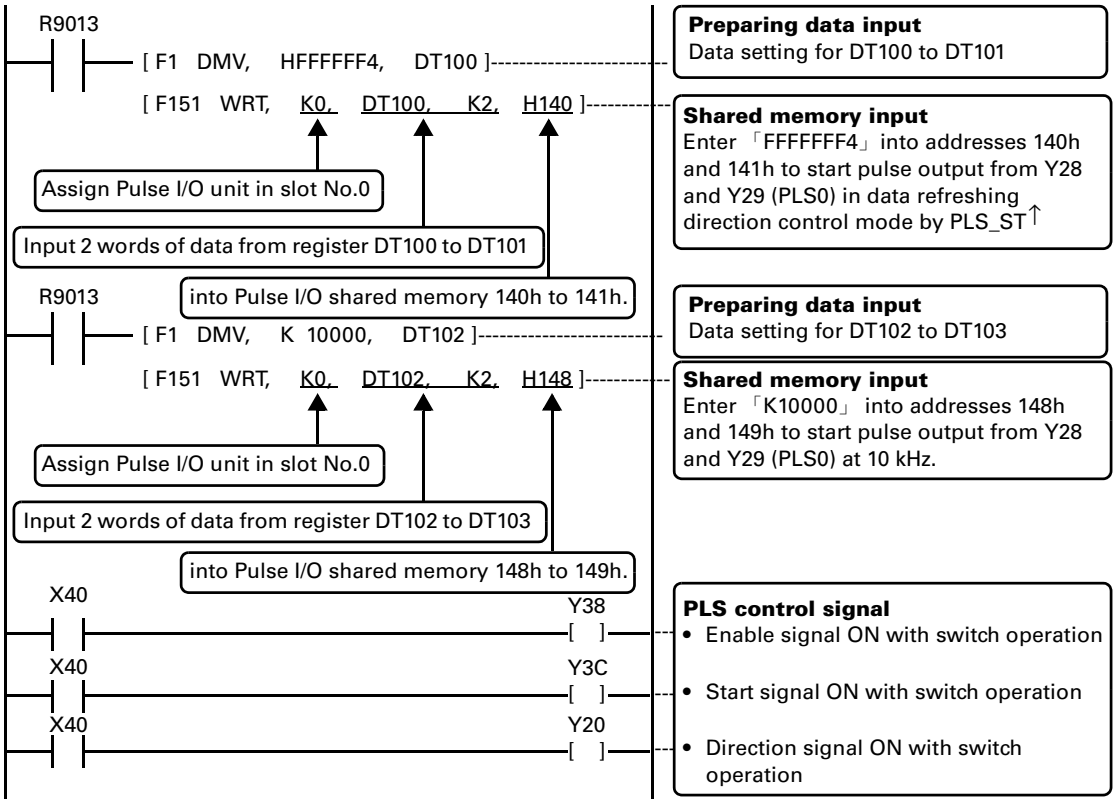
This setting determines the frequency of PLS/PWM pulses. In this example, enter「K10000 (H2710)」into shared memory addresses 148h and 149h, because pulse is sent out from Y28 and Y29 (PLS0) at 10 kHz.

Shared memory 148h, 149h settings

(bit) 32					16	15			0
Setting item	PLS0/PWM0 frequency setting								
Set value	0	0	0	0	2	7	1	0	
Settings	K 10000								

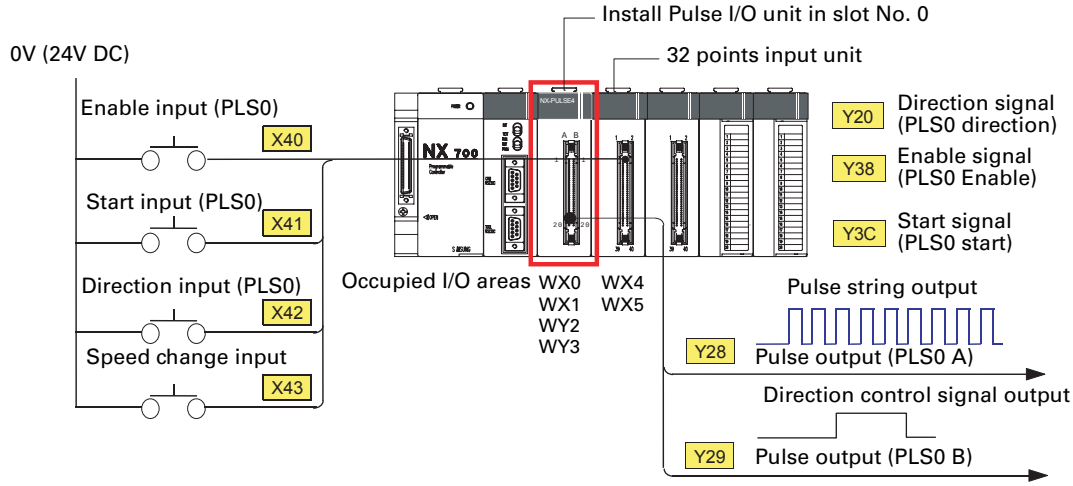
Sample Program

Configure shared memory for pulse output function, and send out pulses with button operation.


R9013
[F1 DMV, HFFFFFF4, DT100]
[F151 WRT, K0, DT100, K2, H140]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 140h to 141h.
R9013
[F1 DMV, K 10000, DT102]
[F151 WRT, K0, DT102, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT102 to DT103
into Pulse I/O shared memory 148h to 149h.
X40
Y38
[ ]
X40
Y3C
[ ]
X40
Y20
[ ]
Preparing data input
Data setting for DT100 to DT101
Shared memory input
Enter 「FFFFFFF4」 into addresses 140h and 141h to start pulse output from Y28 and Y29 (PLS0) in data refreshing direction control mode by PLS_ST↑
Preparing data input
Data setting for DT102 to DT103
Shared memory input
Enter 「K10000」 into addresses 148h and 149h to start pulse output from Y28 and Y29 (PLS0) at 10 kHz.
PLS control signal
• Enable signal ON with switch operation
• Start signal ON with switch operation
• Direction signal ON with switch operation

Use Pulse Output Function (Frequency Change)

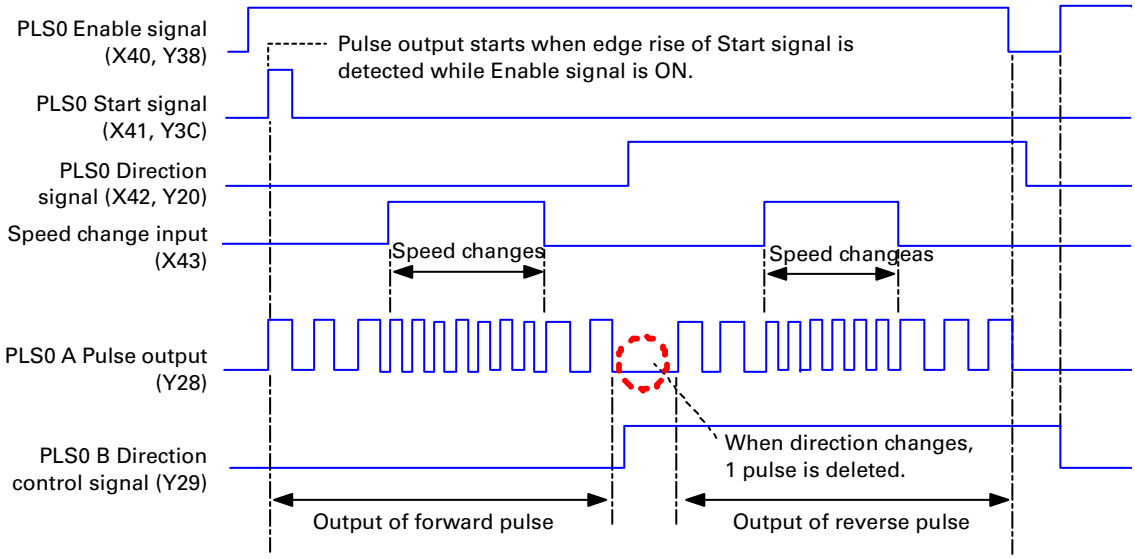
Overview



Sending pulse output in direction control mode. Turn ON Enable input at X40 and Start input. Pulse output starts at Y28 and Y29 (PLS0). When direction input to X42 is ON, pulse changes to reverse. If speed change input is ON at X43, output pulse frequency changes.

Time Chart

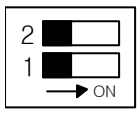
Pulse output changes in reference to the input status of each signal as illustrated below.


PLS0 Enable signal (X40, Y38)
Pulse output starts when edge rise of Start signal is detected while Enable signal is ON.
PLS0 Start signal (X41, Y3C)
PLS0 Direction signal (X42, Y20)
Speed change input (X43)
Speed changes
Speed changeas
PLS0 A Pulse output (Y28)
PLS0 B Direction control signal (Y29)
When direction changes, 1 pulse is deleted.
Output of forward pulse
Output of reverse pulse

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

* Pulse output function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

PLS/PWM setting

Pulse output form is determined by PLS/PWM setting.

In this example, enter 「FFFFFFF8」 into shared memory addresses 140h and 141h, because in data refreshing direction control mode, pulse output starts from Y28 and Y29 (PLS0) when PLSx Start signal edge rises or data is refreshing.

Shared memory 140h, 141h settings

(bit) 32 … 16 15 … 0

Output number	Unused	Unused	Unused	Unused	PLS3	PLS2	PLS1	PLS0
Setting item	Unused	Unused	Unused	Unused	Form setting	Form setting	Form setting	Form setting
Set value	F	F	F	F	F	F	F	8
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	Refresh by Start signal or data change (Direction control)

PLS/PWM frequency setting

This setting determines the frequency of PLS/PWM pulses.

In this example, enter 「K10000」 (H2710) into shared memory addresses 148h and 149h, because pulse output starts at Y28 and Y29 (PLS0) at 10 kHz.
At the moment when speed change input turns ON at X3, re-enter 「K20000 (H4E20)」.

Shared memory 148h, 149h settings

(bit) 32 … 16 15 … 0

Setting item	PLS0/PWM0 frequency setting							
Set value	0	0	0	0	2	7	1	0
Settings	K 10000							

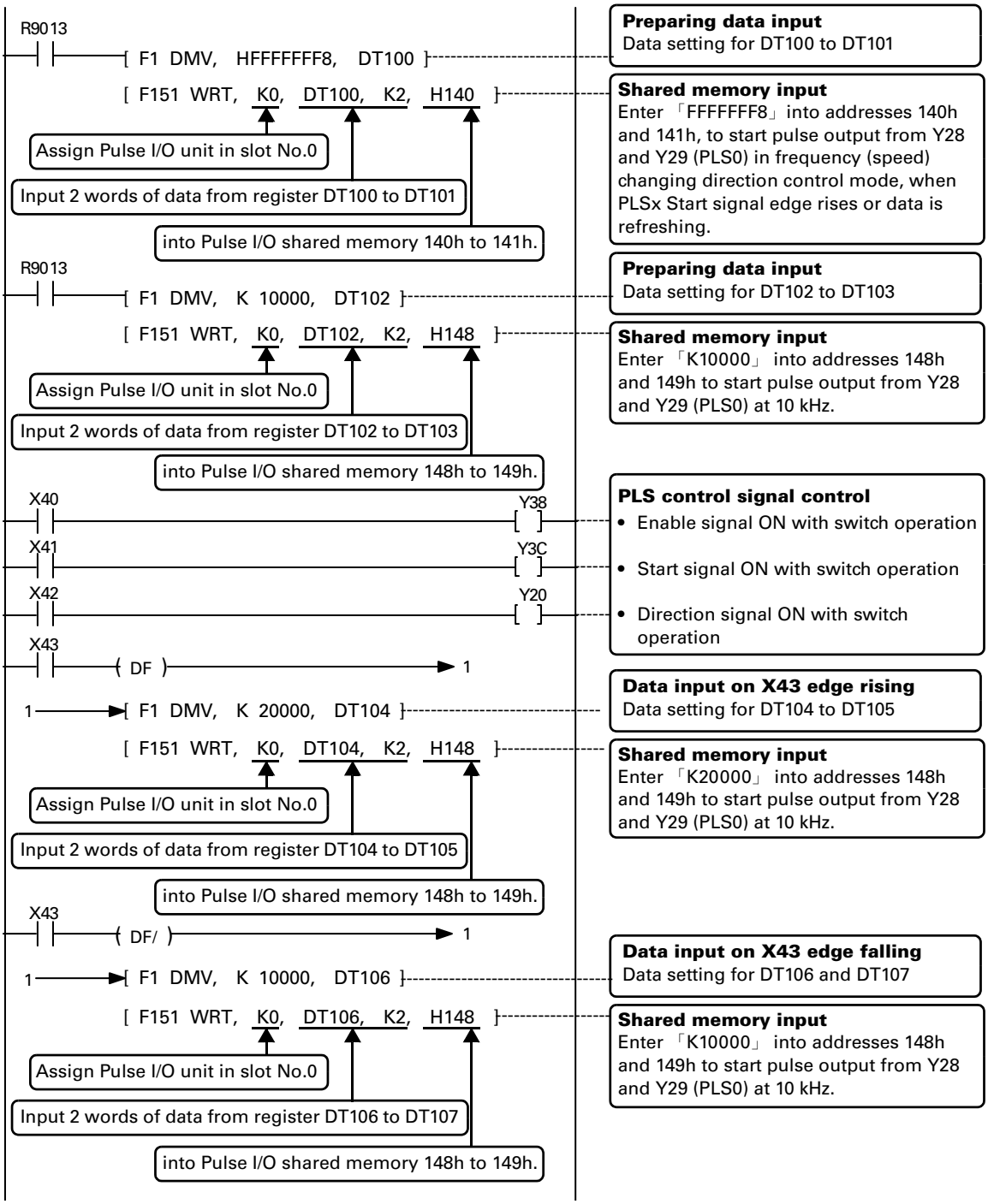
Shared memory 148h, 149h settings (X3 ON)

(bit) 32 … 16 15 … 0

Setting item	PLS0/PWM0 frequency setting							
Set value	0	0	0	0	4	E	2	0
Settings	K 20000							

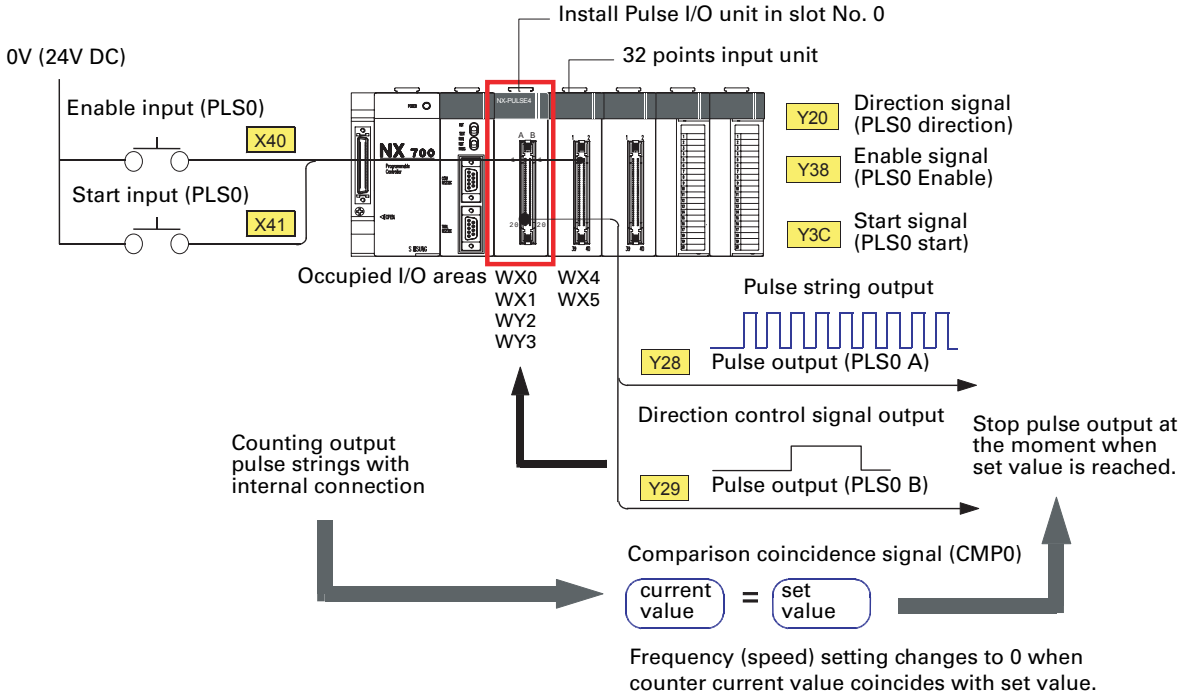
Sample Program

Configure shared memory for pulse output function, and send out pulses with button operation.


R9013
[F1 DMV, HFFFFFFF8, DT100]
[F151 WRT, K0, DT100, K2, H140]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 140h to 141h.
R9013
[F1 DMV, K 10000, DT102]
[F151 WRT, K0, DT102, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT102 to DT103
into Pulse I/O shared memory 148h to 149h.
X40
Y38
X41
Y3C
X42
Y20
X43
DF
1
1
[F1 DMV, K 20000, DT104]
[F151 WRT, K0, DT104, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT104 to DT105
into Pulse I/O shared memory 148h to 149h.
X43
DF/
1
1
[F1 DMV, K 10000, DT106]
[F151 WRT, K0, DT106, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT106 to DT107
into Pulse I/O shared memory 148h to 149h.
Preparing data input
Data setting for DT100 to DT101
Shared memory input
Enter 「FFFFFFF8」 into addresses 140h and 141h, to start pulse output from Y28 and Y29 (PLS0) in frequency (speed) changing direction control mode, when PLSx Start signal edge rises or data is refreshing.
Preparing data input
Data setting for DT102 to DT103
Shared memory input
Enter 「K10000」 into addresses 148h and 149h to start pulse output from Y28 and Y29 (PLS0) at 10 kHz.
PLS control signal control
• Enable signal ON with switch operation
• Start signal ON with switch operation
• Direction signal ON with switch operation
Data input on X43 edge rising
Data setting for DT104 to DT105
Shared memory input
Enter 「K20000」 into addresses 148h and 149h to start pulse output from Y28 and Y29 (PLS0) at 10 kHz.
Data input on X43 edge falling
Data setting for DT106 and DT107
Shared memory input
Enter 「K10000」 into addresses 148h and 149h to start pulse output from Y28 and Y29 (PLS0) at 10 kHz.

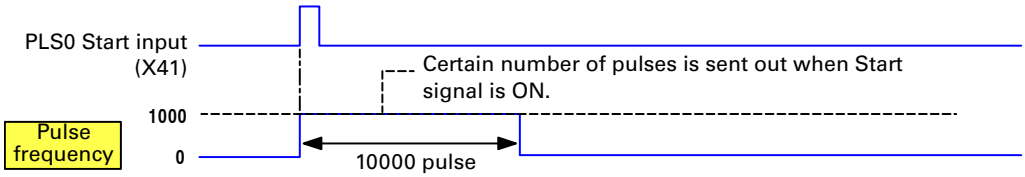
Use Pulse Output Function (Constant Pulse Output)

Overview



Sending pulse output in direction control mode. Turn ON Enable input at X40 and Start input. Pulse output starts at Y28 and Y29 (PLS0). Output pulses are feedback to high-speed counter inside the unit. If a pre-set value is reached, pulse stops.

Pulse output diagram



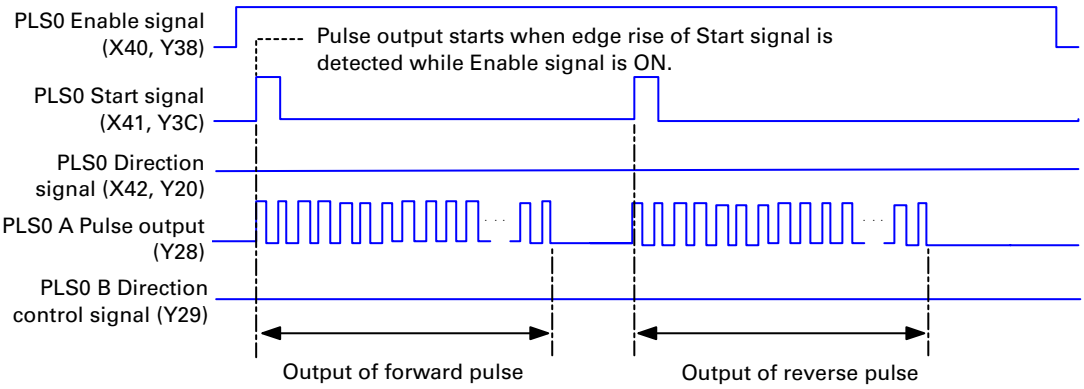
10000 pulses at 1 kHz are sent out by Start input.

ATTENTION

- When the number of output pulses is extremely small, pulse may not stop at the pre-set value due to internal processing (scan time) delay.
- When pulse output is internally connected to counter, the input mode of counter is automatically configured to the pulse output. Be careful because previously configured counter input mode is ignored.
- Within the internal connection, counter and pulse output are fixed at the corresponding CH.

Time Chart

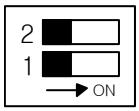
Pulse output changes in reference to the input status of each signal as illustrated below.


PLS0 Enable signal (X40, Y38)
Pulse output starts when edge rise of Start signal is detected while Enable signal is ON.
PLS0 Start signal (X41, Y3C)
PLS0 Direction signal (X42, Y20)
PLS0 A Pulse output (Y28)
PLS0 B Direction control signal (Y29)
Output of forward pulse
Output of reverse pulse

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

* Pulse output function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.

In this example, counter functions is used in direction control mode, output pulses are counted via internal connection, and 「FFFFFF02」 is recorded in shared memory address 100h and 101h.

Shared memory 100h, 101h settings

(bit) 32				16 15			0
External input	X7	X6	X5	X4	X3	X2	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions etting	Input mode	Functions etting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	2
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Internal connection

Configuration of comparison output set value

Setting the "Comparison output set value" to be compared with "Counter current value".
In the example, CMP0 is gained as output when counter current value reaches 10000. Enter「K10000 (H2710)」 into shared memory addresses 120h and 121h.

Shared memory 120h, 121h settings

(bit) 32	16	15	0
Setting item	Comparison output set value (CMP0)		
Set value	0 0 0 0	2 7 1 0	
Settings	K 1000		

Setting the comparison output point

Select the counter CH number and output logic to be used for comparison output function.

In this example, enter「FFFFFFF0」 into shared memory addresses 104h and 105h. Results of comparison between counter current value and comparison output set value are gained as output to CMP0.

Shared memory 104h, 105h settings

(bit) 32	16	15	0
Setting item	CMP7 CMP6 CMP5 CMP4	CMP3 CMP2 CMP1	CMP0
Set value	F F F F	F F F	0
Settings	Unused Unused Unused Unused	Unused Unused Unused	CH0 Comparison *

* CMP0 is ON when current value ≥ set value

PLS/PWM frequency setting

Pulse output form is determined by PLS/PWM setting.

In this example, enter「FFFFFFF6」 into shared memory addresses 140h and 141h. Pulse output starts at Y28 and Y29 (PLS0) in direction control mode, when PLSx Start signal edge rises, or in comparison output mode.

Shared memory 140h, 141h settings

(bit) 32	16	15	0
Output number	Unused Unused Unused Unused	PWM3 PWM2 PWM1	PWM0
Setting item	Unused Unused Unused Unused	Form setting Form setting Form setting	Form setting
Set value	F F F F	F F F	6
Settings	Unused Unused Unused Unused	Unused Unused Unused	Data refresh with Start signal or comparison output

PLS/PWM frequency setting

This setting determines the frequency of PLS/PWM pulses.

In this example, enter「K1000 (H3E8)」into shared memory addresses 148h and 149h, because pulse output starts at Y28 and Y29 (PLS0) at 10kHz. After pulse output starts by Start signal, enter 「K0 (H0)」 to prepare for stopping pulse.

Shared memory 148h, 149h settings (before pulse starts)

(bit) 32				16 15			0
Setting item	PLS0/PWM0 frequency setting						
Set value	0	0	0	0	0	3	E	8
Settings	K 10000						

Shared memory 148h, 149h settings (after pulse starts)

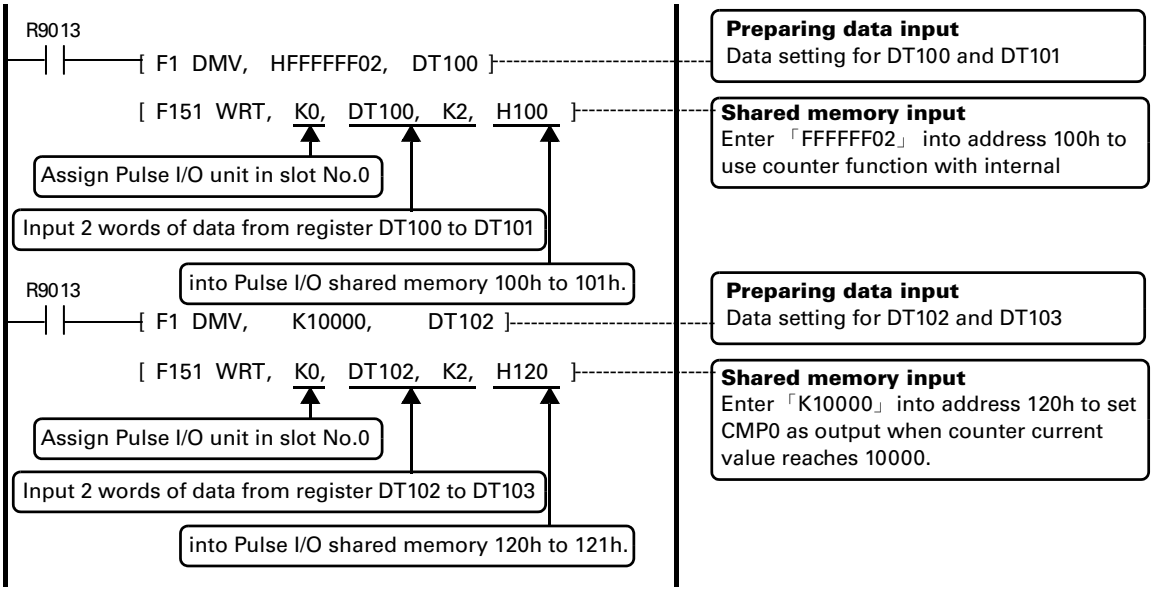
(bit) 32				16 15			0
Setting item	PLS0/PWM0 frequency setting						
Set value	0	0	0	0	0	0	0	0
Settings	K 0						

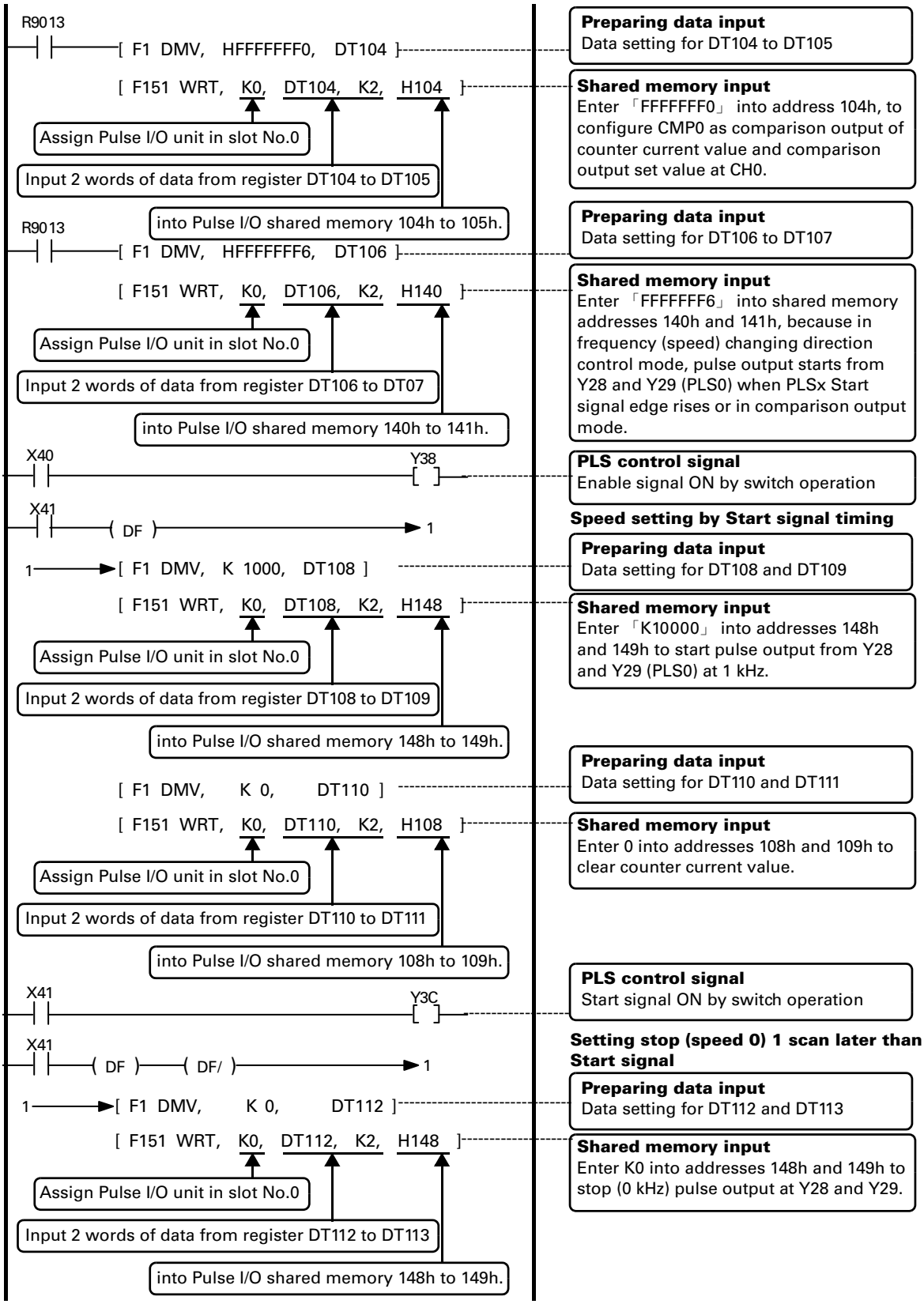
ATTENTION

When pulse frequency (speed) is changed when counter current value coincides with set value via internal connection of pulse output and counter, CMP output for PLSx, PWMx should be set to same CH.

Sample Program

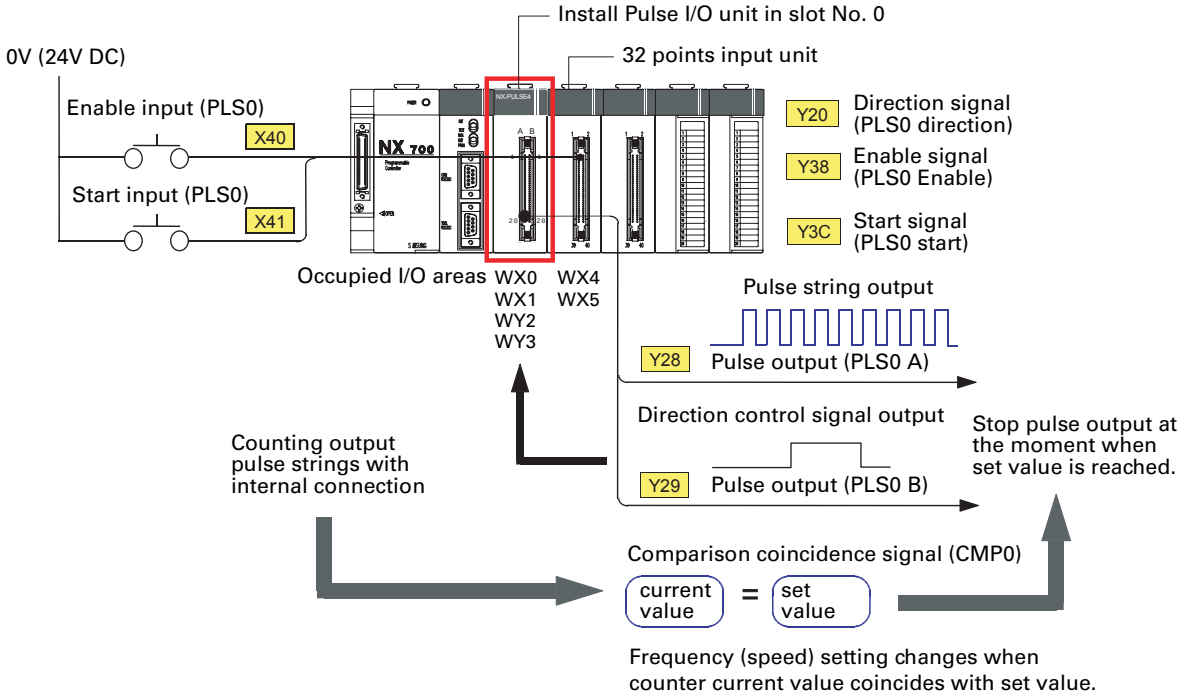
In this example, pulse output, counter and comparison function settings in shared memory are configured, and button operation program is started.


R9013
[F1 DMV, HFFFFFF02, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 100h to 101h.
R9013
[F1 DMV, K10000, DT102]
[F151 WRT, K0, DT102, K2, H120]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT102 to DT103
into Pulse I/O shared memory 120h to 121h.
Preparing data input
Data setting for DT100 and DT101
Shared memory input
Enter 「FFFFFF02」 into address 100h to use counter function with internal
Preparing data input
Data setting for DT102 and DT103
Shared memory input
Enter 「K10000」 into address 120h to set CMP0 as output when counter current value reaches 10000.


R9013
[F1 DMV, HFFFFFFF0, DT104]
[F151 WRT, K0, DT104, K2, H104]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT104 to DT105
into Pulse I/O shared memory 104h to 105h.
Preparing data input
Data setting for DT104 to DT105
Shared memory input
Enter 「FFFFFFF0」 into address 104h, to configure CMP0 as comparison output of counter current value and comparison output set value at CH0.
R9013
[F1 DMV, HFFFFFFF6, DT106]
[F151 WRT, K0, DT106, K2, H140]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT106 to DT07
into Pulse I/O shared memory 140h to 141h.
Preparing data input
Data setting for DT106 to DT107
Shared memory input
Enter 「FFFFFFF6」 into shared memory addresses 140h and 141h, because in frequency (speed) changing direction control mode, pulse output starts from Y28 and Y29 (PLS0) when PLSx Start signal edge rises or in comparison output mode.
X40
Y38
PLS control signal
Enable signal ON by switch operation
X41
DF
1
Speed setting by Start signal timing
1
[F1 DMV, K 1000, DT108]
[F151 WRT, K0, DT108, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT108 to DT109
into Pulse I/O shared memory 148h to 149h.
Preparing data input
Data setting for DT108 and DT109
Shared memory input
Enter 「K10000」 into addresses 148h and 149h to start pulse output from Y28 and Y29 (PLS0) at 1 kHz.
[F1 DMV, K 0, DT110]
[F151 WRT, K0, DT110, K2, H108]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT110 to DT111
into Pulse I/O shared memory 108h to 109h.
Preparing data input
Data setting for DT110 and DT111
Shared memory input
Enter 0 into addresses 108h and 109h to clear counter current value.
X41
Y3C
PLS control signal
Start signal ON by switch operation
X41
DF
DF/
1
Setting stop (speed 0) 1 scan later than Start signal
1
[F1 DMV, K 0, DT112]
[F151 WRT, K0, DT112, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT112 to DT113
into Pulse I/O shared memory 148h to 149h.
Preparing data input
Data setting for DT112 and DT113
Shared memory input
Enter K0 into addresses 148h and 149h to stop (0 kHz) pulse output at Y28 and Y29.

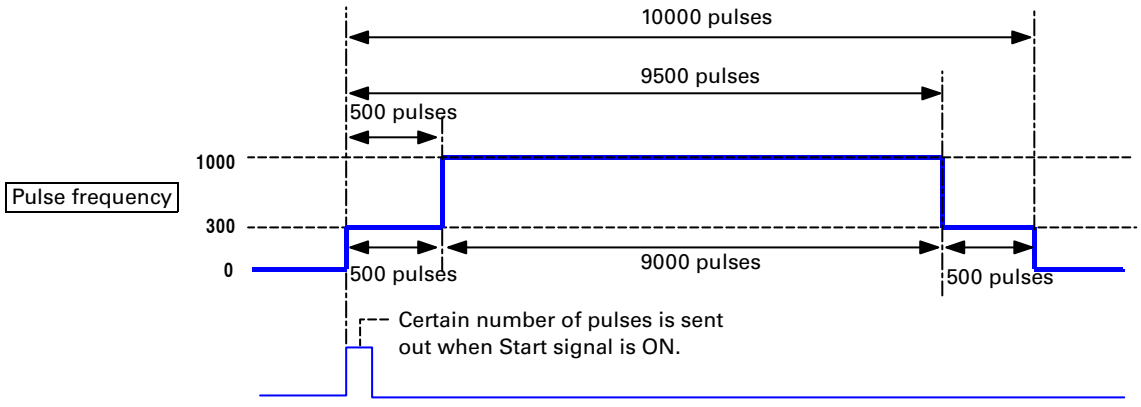
Use Pulse Output Function (Setting Increase/ Decrease Position)

Overview



Sending pulse output in direction control mode. Turn ON Enable input at X40 and Start input. Pulse output starts at Y28 and Y29 (PLS0). Output pulses are feedback to high-speed counter inside the unit. If a pre-set value is reached, pulse stops. Locating with 2-level speed shift is available.

Pulse output diagram



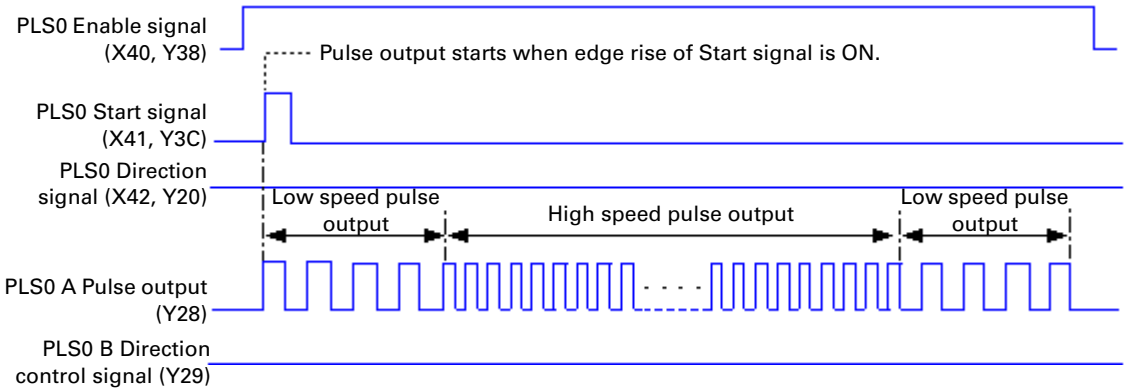
By Start input, 500 pulses with Max. speed around 1kHz are transformed into 10000 pulses at 300 Hz, and sent out as output.

ATTENTION

When the number of pulses at frequency changing point gets near to extreme, frequency may not be changed due to delay of internal processing (scan time).

Time Chart

Pulse output changes in reference to the input status of each signal as illustrated below.


PLS0 Enable signal (X40, Y38)
Pulse output starts when edge rise of Start signal is ON.
PLS0 Start signal (X41, Y3C)
PLS0 Direction signal (X42, Y20)
Low speed pulse output
High speed pulse output
Low speed pulse output
PLS0 A Pulse output (Y28)
PLS0 B Direction control signal (Y29)

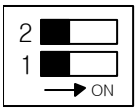
ATTENTION

- When pulse output is internally connected to counter, the input mode of counter is automatically configured to the pulse output. Be careful because previously configured counter input mode is ignored.
- Within the internal connection, counter and pulse output are fixed at the corresponding CH.

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

* Pulse output function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.

In this example, counter functions is used in direction control mode, output pulses are counted via internal connection, and 「FFFFFF02」 is recorded in shared memory address 100h and 101h.

Shared memory 100h, 101h settings

(bit) 32					16 15			0
External input	X7	X6	X5	X4	X3	X2	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	0	2
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Direction control	Internal connection

Setting the comparison output point

Select the counter CH number and output logic to be used for comparison output function.

In this example, enter 「FFFFFFF0」 into shared memory addresses 104h and 105h. Results of comparison between counter current value and comparison output set value are gained as output to CMP0.

Shared memory 104h, 105h settings

(bit) 32				16 15				0
Comparison Input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	F	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	CH0 Comparison *

* CMP0 is ON when current value ≥ set value

Setting the comparison output set value

Setting the "Comparison output set value" to be compared with "Counter current value".
In the example, CMP0 is gained as output when counter current value reaches 500. Enter 「K500 (H1F4)」 into shared memory addresses 120h and 121h. Two values 「K9500 (H251C)」 and 「K10000 (H2710)」 are entered in turn every time comparison coincidence (CMP0) is ON.

Shared memory 120h, 121h settings (Increase/decrease end pointer)

(bit) 32					16 15			0
Setting item	Comparison output set value (CMP0)							
Set value	0	0	0	0	0	1	F	4
Settings	K 500							

Shared memory 120h, 121h settings (Max. speed end pointer)

(bit) 32					16 15			0
Setting item	Comparison output set value (CMP0)							
Set value	0	0	0	0	2	5	1	C
Settings	K 9500							

Shared memory 120h, 121h settings (Stop pointer)

(bit) 32	16	15	0
Setting item	Comparison output set value (CMP0)		
Set value	0 0 0 0	2 7 1 0	
Settings	K 10000		

PLS/PWM Setting

Pulse output form is determined by PLS/PWM setting.

In this example, enter「FFFFFFF6」into shared memory addresses 140h and 141h, because in frequency (speed) changing direction control mode, pulse output starts from Y28 and Y29 (PLS0) when PLSx Start signal edge rises, or in comparison output mode.

Shared memory 140h, 141h settings

(bit) 32	16	15	0
Output number	Unused Unused Unused Unused	PLS3 PLS2 PLS1	PLS0
Setting item	Unused Unused Unused Unused	Form setting Form setting Form setting	Form setting
Set value	F F F F	F F F	6
Settings	Unused Unused Unused Unused	Unused Unused Unused	Data refresh with Start signal or comparison output

PLS/PWM frequency setting

This setting determines the frequency of PLS/PWM pulses.
In this example, enter「K300 (H12C)」into shared memory addresses 148h and 149h, because pulse output starts at Y28 and Y29 (PLS0) at 10 kHz The entered value is replaced with「K1000 (H3E8)」before comparison coincidence (CMP0) turns ON, to prepare for pulse frequency (speed) change in comparison output mode. It changes again to「K300 (H12C)」before deceleration, and「K0 (H0)」before stop.

Shared memory 148h, 149h settings (Acceleration, deceleration)

(bit) 32	16	15	0
Setting item	PLS0/PWM0 frequency setting		
Set value	0 0 0 0	0 1 2 C	
Settings	K 300		

Shared memory 148h, 149h settings (At Max. speed)

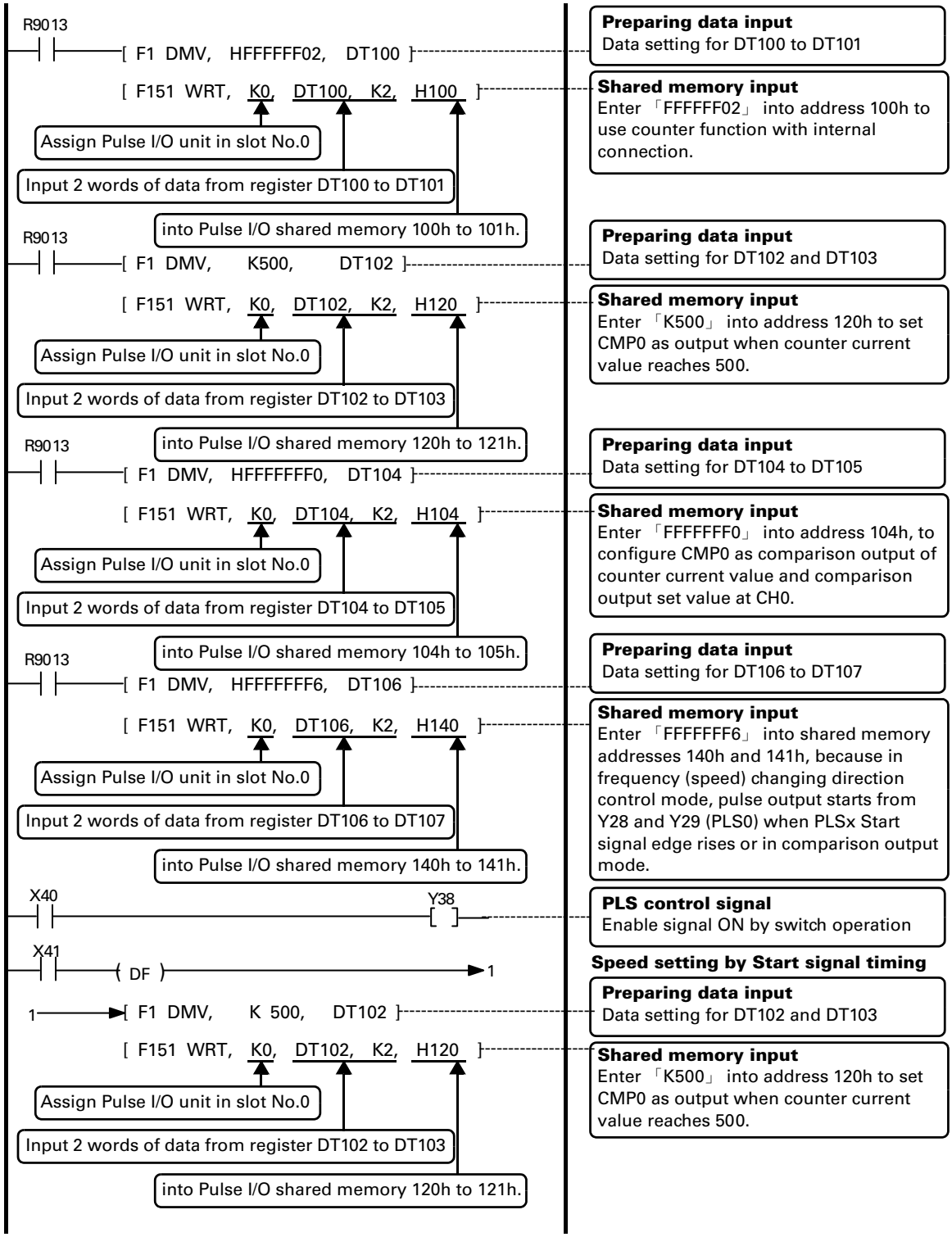
(bit) 32	16	15	0
Setting item	PLS0/PWM0 frequency setting		
Set value	0 0 0 0	0 3 E 8	
Settings	K 1000		

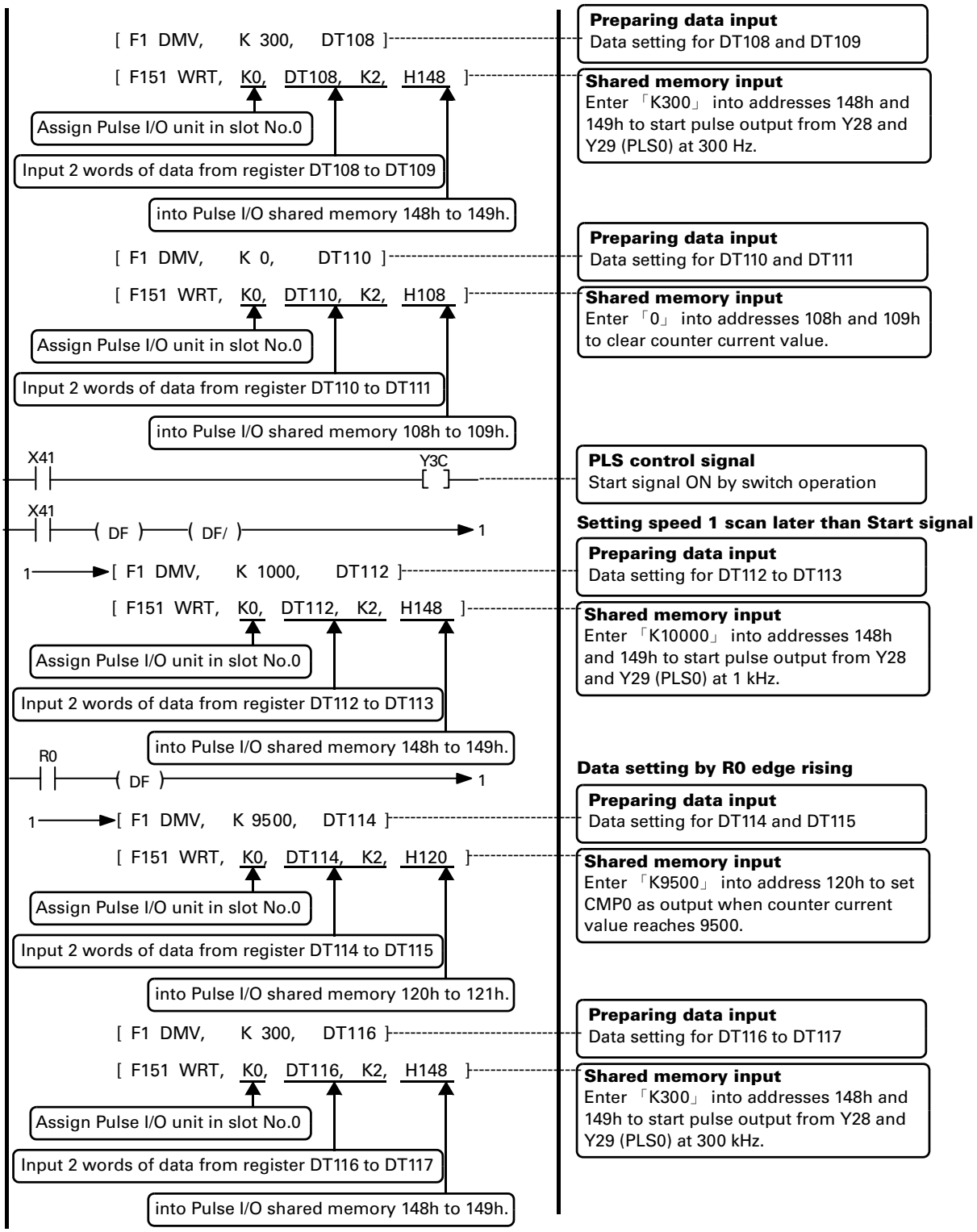
Shared memory 148h, 149h settings (Stopped)

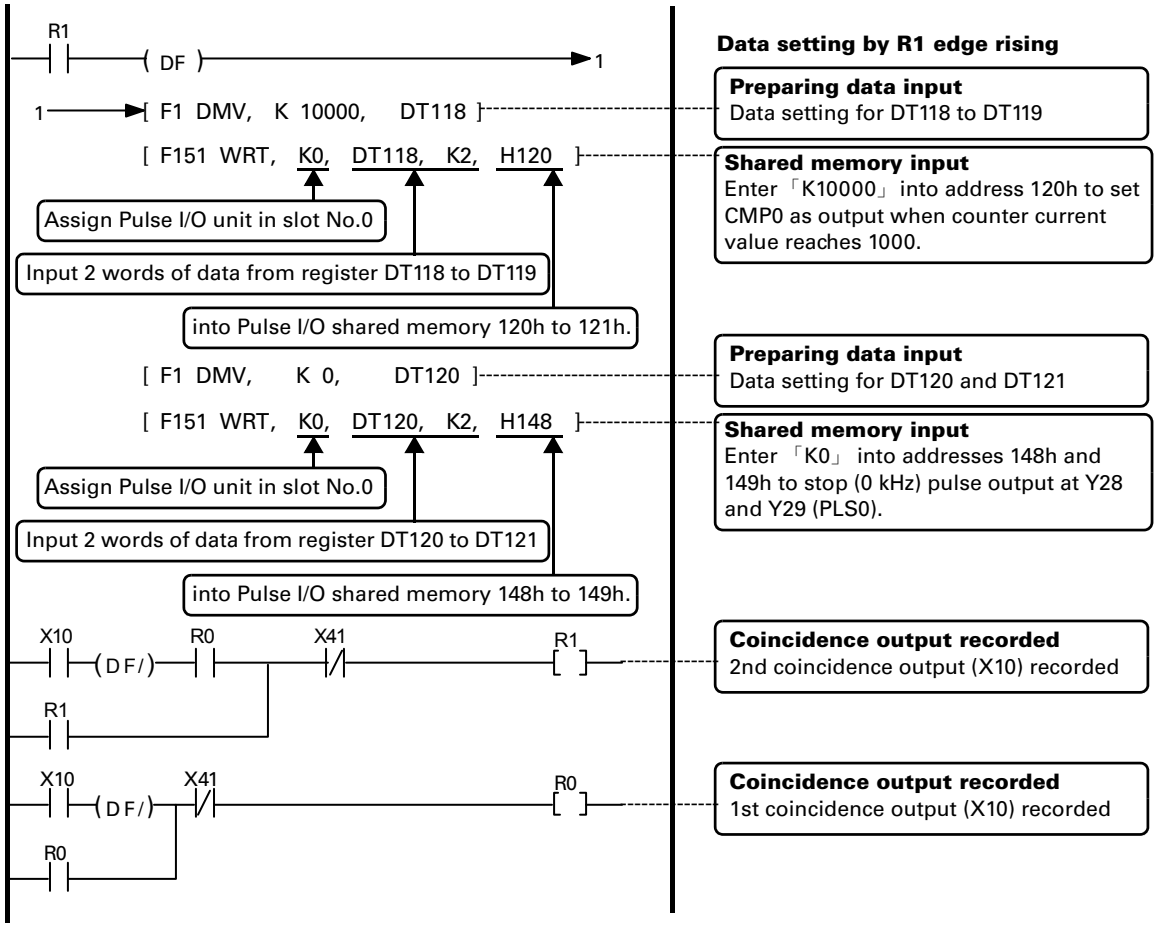
(bit) 32	16	15	0
Setting item	PLS0/PWM0 frequency setting		
Set value	0 0 0 0	0 0 0 0	
Settings	K 0		

Sample Program

In this example, pulse output, counter and comparison function settings in shared memory are configured, and button operation program is started.


R9013
[F1 DMV, HFFFFFF02, DT100]
[F151 WRT, K0, DT100, K2, H100]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 100h to 101h.
Preparing data input
Data setting for DT100 to DT101
Shared memory input
Enter 「FFFFFF02」 into address 100h to use counter function with internal connection.
R9013
[F1 DMV, K500, DT102]
[F151 WRT, K0, DT102, K2, H120]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT102 to DT103
into Pulse I/O shared memory 120h to 121h.
Preparing data input
Data setting for DT102 and DT103
Shared memory input
Enter 「K500」 into address 120h to set CMP0 as output when counter current value reaches 500.
R9013
[F1 DMV, HFFFFFFF0, DT104]
[F151 WRT, K0, DT104, K2, H104]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT104 to DT105
into Pulse I/O shared memory 104h to 105h.
Preparing data input
Data setting for DT104 to DT105
Shared memory input
Enter 「FFFFFFF0」 into address 104h, to configure CMP0 as comparison output of counter current value and comparison output set value at CH0.
R9013
[F1 DMV, HFFFFFFF6, DT106]
[F151 WRT, K0, DT106, K2, H140]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT106 to DT107
into Pulse I/O shared memory 140h to 141h.
Preparing data input
Data setting for DT106 to DT107
Shared memory input
Enter 「FFFFFFF6」 into shared memory addresses 140h and 141h, because in frequency (speed) changing direction control mode, pulse output starts from Y28 and Y29 (PLS0) when PLSx Start signal edge rises or in comparison output mode.
X40
Y38
PLS control signal
Enable signal ON by switch operation
X41
DF
1
Speed setting by Start signal timing
1
[F1 DMV, K 500, DT102]
[F151 WRT, K0, DT102, K2, H120]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT102 to DT103
into Pulse I/O shared memory 120h to 121h.
Preparing data input
Data setting for DT102 and DT103
Shared memory input
Enter 「K500」 into address 120h to set CMP0 as output when counter current value reaches 500.


[F1 DMV, K 300, DT108]
[F151 WRT, K0, DT108, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT108 to DT109
into Pulse I/O shared memory 148h to 149h.
[F1 DMV, K 0, DT110]
[F151 WRT, K0, DT110, K2, H108]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT110 to DT111
into Pulse I/O shared memory 108h to 109h.
X41
Y3C
X41
DF
DF/
1
1
[F1 DMV, K 1000, DT112]
[F151 WRT, K0, DT112, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT112 to DT113
into Pulse I/O shared memory 148h to 149h.
R0
DF
1
1
[F1 DMV, K 9500, DT114]
[F151 WRT, K0, DT114, K2, H120]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT114 to DT115
into Pulse I/O shared memory 120h to 121h.
[F1 DMV, K 300, DT116]
[F151 WRT, K0, DT116, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT116 to DT117
into Pulse I/O shared memory 148h to 149h.
Preparing data input
Data setting for DT108 and DT109
Shared memory input
Enter 「K300」 into addresses 148h and 149h to start pulse output from Y28 and Y29 (PLS0) at 300 Hz.
Preparing data input
Data setting for DT110 and DT111
Shared memory input
Enter 「0」 into addresses 108h and 109h to clear counter current value.
PLS control signal
Start signal ON by switch operation
Setting speed 1 scan later than Start signal
Preparing data input
Data setting for DT112 to DT113
Shared memory input
Enter 「K10000」 into addresses 148h and 149h to start pulse output from Y28 and Y29 (PLS0) at 1 kHz.
Data setting by R0 edge rising
Preparing data input
Data setting for DT114 and DT115
Shared memory input
Enter 「K9500」 into address 120h to set CMP0 as output when counter current value reaches 9500.
Preparing data input
Data setting for DT116 to DT117
Shared memory input
Enter 「K300」 into addresses 148h and 149h to start pulse output from Y28 and Y29 (PLS0) at 300 kHz.

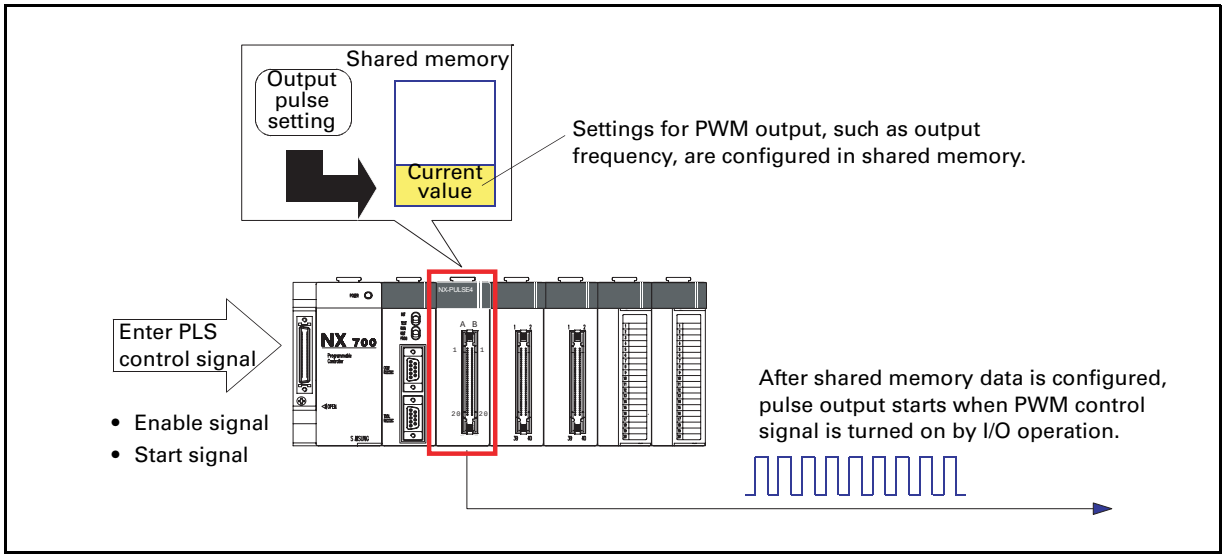

R1
DF
1
1
[F1 DMV, K 10000, DT118]
[F151 WRT, K0, DT118, K2, H120]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT118 to DT119
into Pulse I/O shared memory 120h to 121h.
[F1 DMV, K 0, DT120]
[F151 WRT, K0, DT120, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT120 to DT121
into Pulse I/O shared memory 148h to 149h.
X10
DF/
R0
X41
R1
R1
X10
DF/
X41
R0
R0
Data setting by R1 edge rising
Preparing data input
Data setting for DT118 to DT119
Shared memory input
Enter「K10000」into address 120h to set CMP0 as output when counter current value reaches 1000.
Preparing data input
Data setting for DT120 and DT121
Shared memory input
Enter「K0」into addresses 148h and 149h to stop (0 kHz) pulse output at Y28 and Y29 (PLS0).
Coincidence output recorded
2nd coincidence output (X10) recorded
Coincidence output recorded
1st coincidence output (X10) recorded

PWM Output Function

PWM Output Function

What is PWM Output Function?

- PWM output function enables change of output Duty at any frequency by 1% unit within the range of 0 to 100%.
  Available frequency range is 1Hz to 30kHz, and setting unit is 1Hz.
- Pulse I/O unit provides up to 4CH PWM output.
  But user must choose between PWM and pulse output, so if pulse output is selected, the number of CH for PWM output is decreased.


Shared memory
Output pulse setting
Current value
Settings for PWM output, such as output frequency, are configured in shared memory.
Enter PLS control signal
• Enable signal
• Start signal
After shared memory data is configured, pulse output starts when PWM control signal is turned on by I/O operation.

ATTENTION

Pulse output (pulse, PWM) consists of 4CH as described below.

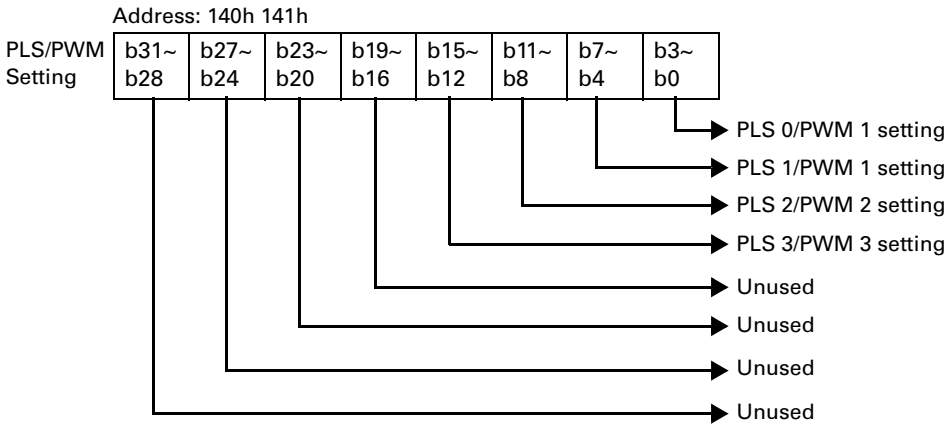
- CH 0: PLS0 output or PWM0 output
- CH 1: PLS1 output or PWM1 output
- CH 2: PLS2 output or PWM2 output
- CH 3: PLS3 output or PWM3 output

PWM Output Function Configuration

- To use PWM output function, Step ①. PLS/PWM setting of shared memory, Step ②. PLS/PWM frequency setting of shared memory, and Step ③. PWM Duty setting of shared memory are needed.
- Beside shared memory setting, Enable and Start signals are needed to be controlled with PWM control signal.

Step ①. Shared Memory Setting (PLS/PWM setting)

Set PWM output form by shared memory PLS/PWM settings.



Pulse output setting (PWM, PLS)

Set value (HEX)	Functions		
	Pulse function	Data change timing	Output mode
0	PWM	Refresh on edge rise of PLSx start signal	-
1		Edge rise of PLSx start signal, or comparison output	
2		Edge rise of PLSx start signal, or data refresh	
3		Reserved area	
4	PLS	Refresh on edge rise of PLSx start signal	Direction control
5			Individual output
6		Edge rise of PLSx start signal, or comparison output	Direction control
7			Individual output
8		Edge rise of PLSx start signal, or data refresh	Direction control
9			Individual output
A	Invalid * 1	Invalid * 1	Invalid * 1
B			
C			
D			
E			
F	Not used * 2	-	-

*1: Do not use this setting.

*2: Initial value on power input is set to unused.

ATTENTION Make sure to access shared memory by 2 word unit

NOTE See *"Shared Memory Areas" in Chapter 1* for shared memory addresses.

Step ② Shared memory setting (PLS/PWM frequency setting)

- Configure frequency of output pulses after PLS/PWM setting of shared memory.
- Frequency is set within the range of 1 Hz to 30 kHz by 1 Hz unit. Output turns OFF (pulse stop) when frequency setting exceeds 32.768 kHz.
- When frequency is set to 0 Hz and data is refreshed, pulse output is stopped.

PLS 0/PWM 0 frequency setting	Address: 148h 149h	PLS: K1 to K30000
PLS 1/PWM 1 frequency setting	Address: 14Ah, 14Bh	PLS: K1 to K30000
PLS 2/PWM 2 frequency setting	Address: 14Ch 14Dh	PLS: K1 to K30000
PLS 3/PWM 3 frequency setting	Address: 14Eh 14Fh	PLS: K1 to K30000

Step ③ Shared memory setting (PWM duty setting)

- Configure Duty of output pulses after PLS/PWM setting of shared memory.
- Within range of 0% to 100%, by 1% unit. The value indicates the proportion of ON.
- 0% means output OFF, and 100% means output ON.
  Output OFF when value exceeds 101%.

PWM 0 Duty setting	Address: 158h 159h	K0 to K100
PWM1 Duty setting	Address: 15Ah 15Bh	K0 to K100
PWM2 Duty setting	Address: 15Ch 15Dh	K0 to K100
PWM3 Duty setting	Address: 15Eh 15Fh	K0 to K100

ATTENTION

- Make sure to access shared memory by 2 word unit.
- Do not set a value out of the permitted range. It may cause errors.
- Error detection upper limit of the unit is 1048.575 kHz. (1048.575 kHz = FFFFFh)
  When setting exceeds the limit, the value based on the lower 20-bit is applied.

STEP ④ PWM control signal

➡ After shared memory setting, Enable and Start signals are needed to be controlled with PWM control signal.

Enable signal

→Enable signal determines valid/stop of PWM output.

ON: PWM output valid
OFF: PWM output stop

Start signal

→Start signal starts PWM output, and changes pulse frequency and Duty.
Frequency can also be changed at the time of comparison coincidence or data refresh, by Pulse output setting.

This signal is valid only when Enable signal is ON. It is invalid when Enable signal is OFF.
When both Enable and Start signals are ON, pulse output is permitted.

First ON of Start signal: PWM output start
Later OFF →ON edge: Change of output pulse frequency and Duty

➡ Output allocation for each control signal is shown in the table below.

Control signal allocation table

Output	Functions		
Allocation	Pulse output CH	Control events	Remarks
Y38	PWM0	Enable control	OFF: PWM output stop ON: PWM output valid
Y39	PWM1		
Y3A	PWM2		
Y3B	PWM3		
Y3C	PWM0	Start control	First ON: PWM output start OFF →ON edge: Output pulse frequency, Duty changed
Y3D	PWM1		
Y3E	PWM2		
Y3F	PWM3		

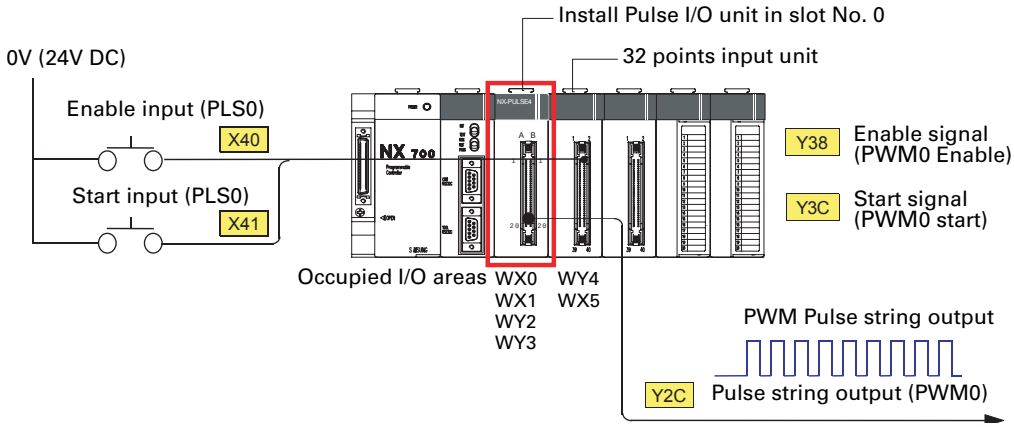
ATTENTION

- Same function is allocated to same location for pulse and PWM control signal.
- On shared memory, PLS/PWM setting, PLS/PWM frequency setting, and PWM Duty setting should be arranged in the above order.
- If not, it may not work properly.
- When frequency or Duty is changed during PWM output, new setting applies from the next waveform.

NOTE PLS/PWM flag is prepared at shared memory addresses 142h and 143h. Pulse output can be monitored by reading the flag in these addresses. See *"PLS/PWM Flag" in Chapter 1* for details.

Use PWM Output Function

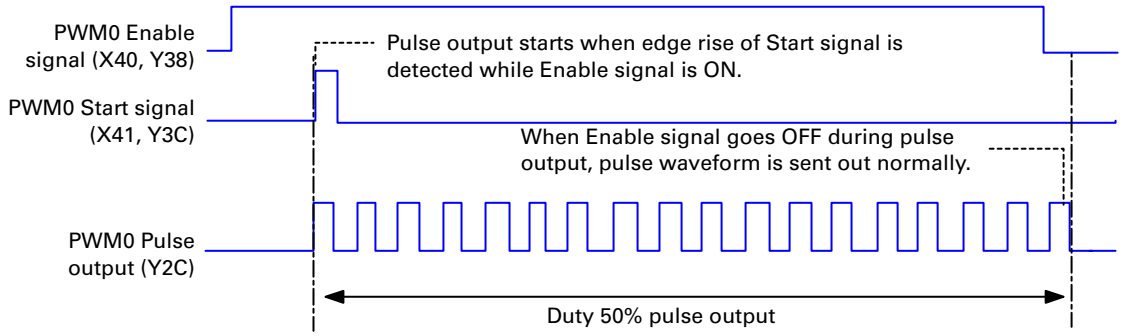
Overview



Sending pulse output in direction control mode.
Turn ON Enable input at X40 and Start input. Pulse output starts at Y28 and Y29 (PLS0).
When direction input at X42 is ON, pulse changes to reverse direction.

Time Chart

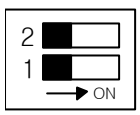
PWM output changes in reference to the input status of each signal as illustrated below.


PWM0 Enable signal (X40, Y38)
Pulse output starts when edge rise of Start signal is detected while Enable signal is ON.
PWM0 Start signal (X41, Y3C)
When Enable signal goes OFF during pulse output, pulse waveform is sent out normally.
PWM0 Pulse output (Y2C)
Duty 50% pulse output

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

* PWM output function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

PLS/PWM Setting

Pulse output form is determined by PLS/PWM setting.

In this example, enter「FFFFFFF0」into shared memory addresses 140h and 141h. In data refreshing direction control mode, PWM output starts from Y2C (PWM0) when PLSx Start signal edge rises.

Shared memory 140h, 141h settings

(bit) 32					16 15			0
Output number	Unused	Unused	Unused	Unused	PWM3	PWM2	PWM1	PWM0
Setting item	Unused	Unused	Unused	Unused	Form setting	Form setting	Form setting	Form setting
Set value	F	F	F	F	F	F	F	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Unused	Data refresh by Start signal

PLS/PWM frequency setting

This setting determines the frequency of PWM output.
In this example, enter「K10000(H2710)」into shared memory addresses 148h and 149h. PWM output starts from Y2C (PWM0) at 10 kHz.

Shared memory 148h, 149h settings

(bit) 32				16 15				0
Setting item	PLS0/PWM0 frequency setting							
Set value	0	0	0	0	2	7	1	0
Settings	K 10000							

PWM Duty Setting

This setting determines Duty of PWM output.

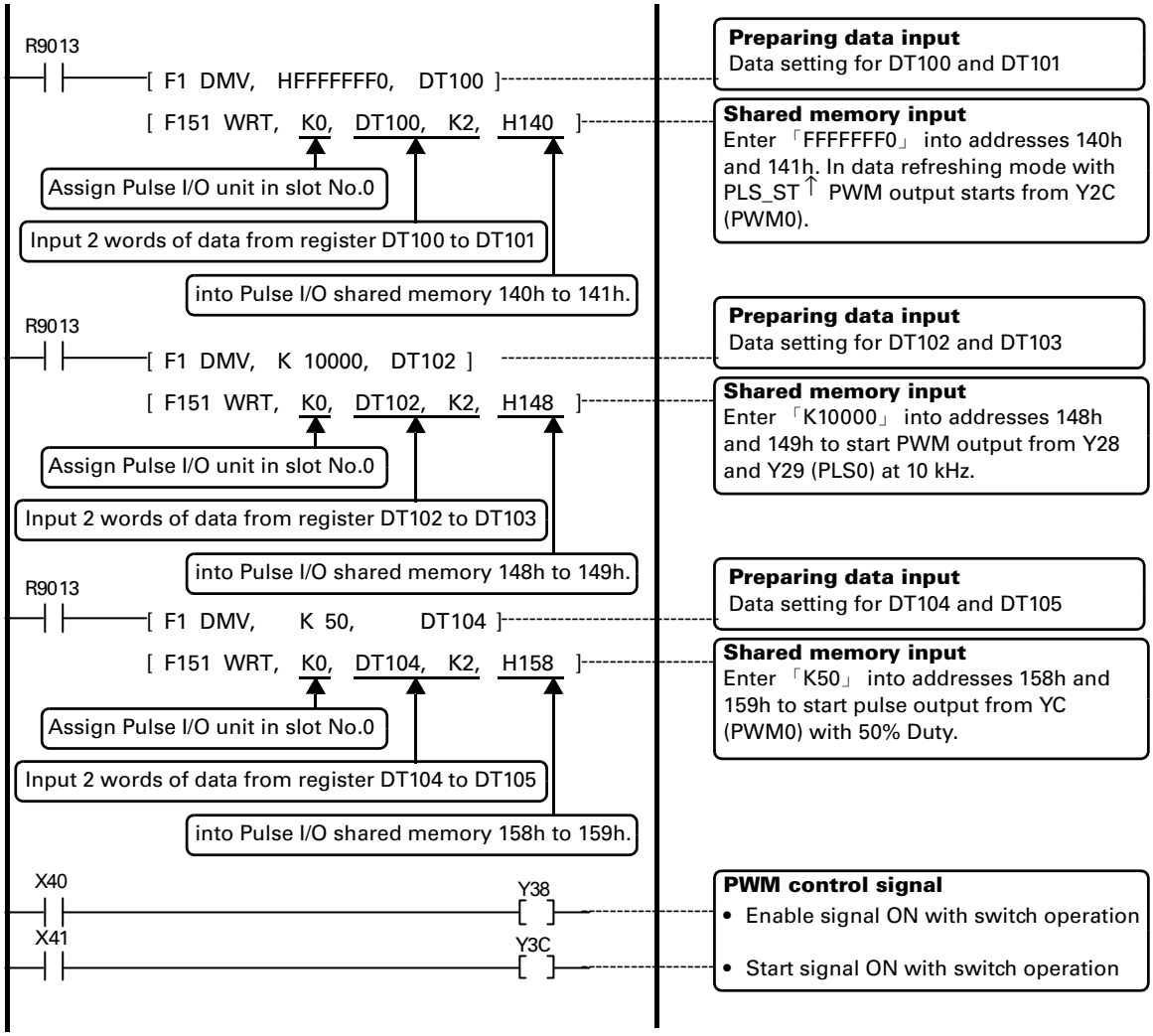
In this example, enter K50 (H32) into shared memory addresses 158h and 159h. PWM output starts from Y2C (PWM0) at 50% Duty.

Shared Memory 158h, 159h Settings

(bit) 32				16 15				0
Setting item	PWM0/PWM0 Duty setting							
Set value	0	0	0	0	0	0	3	2
Settings	K 50							

Sample Program

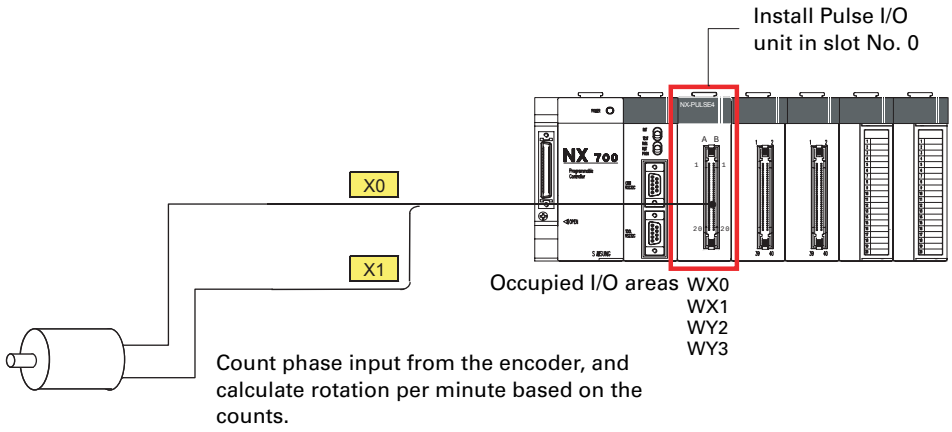
Configure shared memory for PWM output function, and send out PWM with button operation.


R9013
[F1 DMV, HFFFFFFF0, DT100]
[F151 WRT, K0, DT100, K2, H140]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT100 to DT101
into Pulse I/O shared memory 140h to 141h.
Preparing data input
Data setting for DT100 and DT101
Shared memory input
Enter 「FFFFFFF0」 into addresses 140h and 141h. In data refreshing mode with PLS_ST ↑ PWM output starts from Y2C (PWM0).
R9013
[F1 DMV, K 10000, DT102]
[F151 WRT, K0, DT102, K2, H148]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT102 to DT103
into Pulse I/O shared memory 148h to 149h.
Preparing data input
Data setting for DT102 and DT103
Shared memory input
Enter 「K10000」 into addresses 148h and 149h to start PWM output from Y28 and Y29 (PLS0) at 10 kHz.
R9013
[F1 DMV, K 50, DT104]
[F151 WRT, K0, DT104, K2, H158]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT104 to DT105
into Pulse I/O shared memory 158h to 159h.
Preparing data input
Data setting for DT104 and DT105
Shared memory input
Enter 「K50」 into addresses 158h and 159h to start pulse output from YC (PWM0) with 50% Duty.
X40
Y38
X41
Y3C
PWM control signal
• Enable signal ON with switch operation
• Start signal ON with switch operation

Sample Program

Speed Measuring

Overview


Install Pulse I/O unit in slot No. 0
X0
X1
Occupied I/O areas WX0
WX1
WY2
WY3
Count phase input from the encoder, and calculate rotation per minute based on the counts.

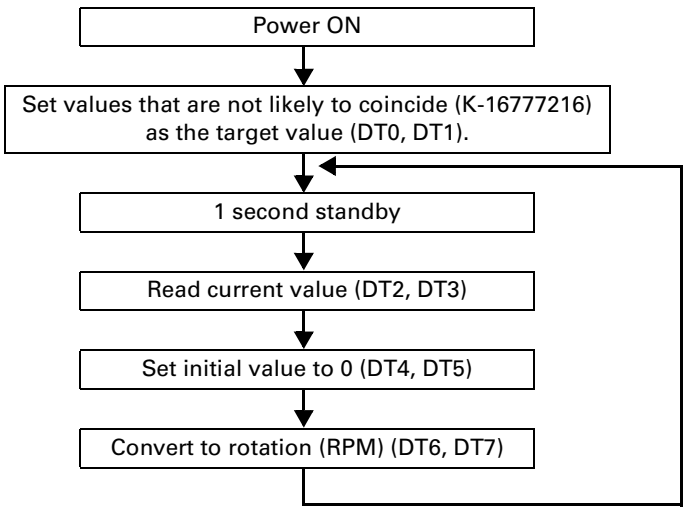
Formula for calculation of rotation per minute

$$\text{Rotation per minute} = \frac{\text{Pulse per second}}{\text{Pulse per rotation}} \times 60 = \frac{\text{Pulse per second}}{1000} = \text{Pulse per second} \times \frac{3}{50}$$

Enter phase signal in X0 and X1, and measure every second.
In this example, the resolution of encoder is 1000 pulses/rotation.

Rotation per minute is stored in DT 6 and DT7 for later checking with monitor functions of programming tools such as WinFPST S/W.

Flow Chart

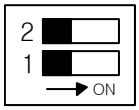

Power ON
Set values that are not likely to coincide (K-16777216) as the target value (DT0, DT1).
1 second standby
Read current value (DT2, DT3)
Set initial value to 0 (DT4, DT5)
Convert to rotation (RPM) (DT6, DT7)

IMPORTANT In phase differential input mode, the input pulse magnification can change with multiplication function. See *"Chapter 2"* for detail.

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No interrupt function

Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter Setting

Setting the operation mode for each counter CH.

In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode; therefore, enter 「FFFFFF20」 to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase input	Terminal input

Counter Current Value Setting

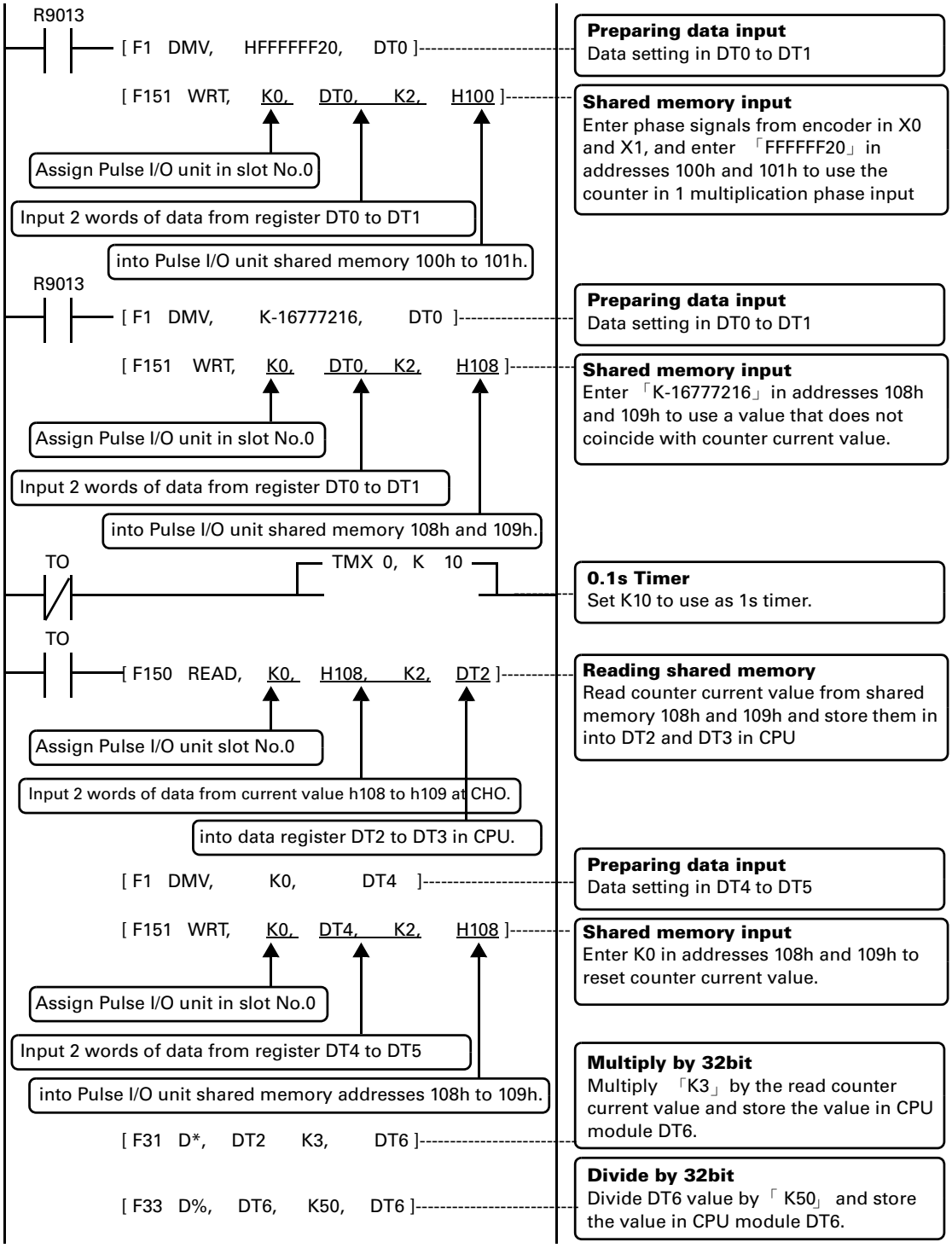
Enter a value that does not coincide with counter current value at CH0. In this example, enter「K-16777216(H FF000000)」 in shared memory addresses 108h and 109h where the current value has been stored.

Shared Memory 108h, 109h Settings

(bit) 32					16 15			0
Setting item	Comparison output set value (CMP0)							
Set value	0	0	0	0	0	0	0	0
Settings	K-16777216							

Sample Program

Enter「FFFFFF20」in counter setting areas (100h, 101h) of shared memory address, and the enter phase signal from encoder in X0 and X1, and calculate rotation per minute based on the values.

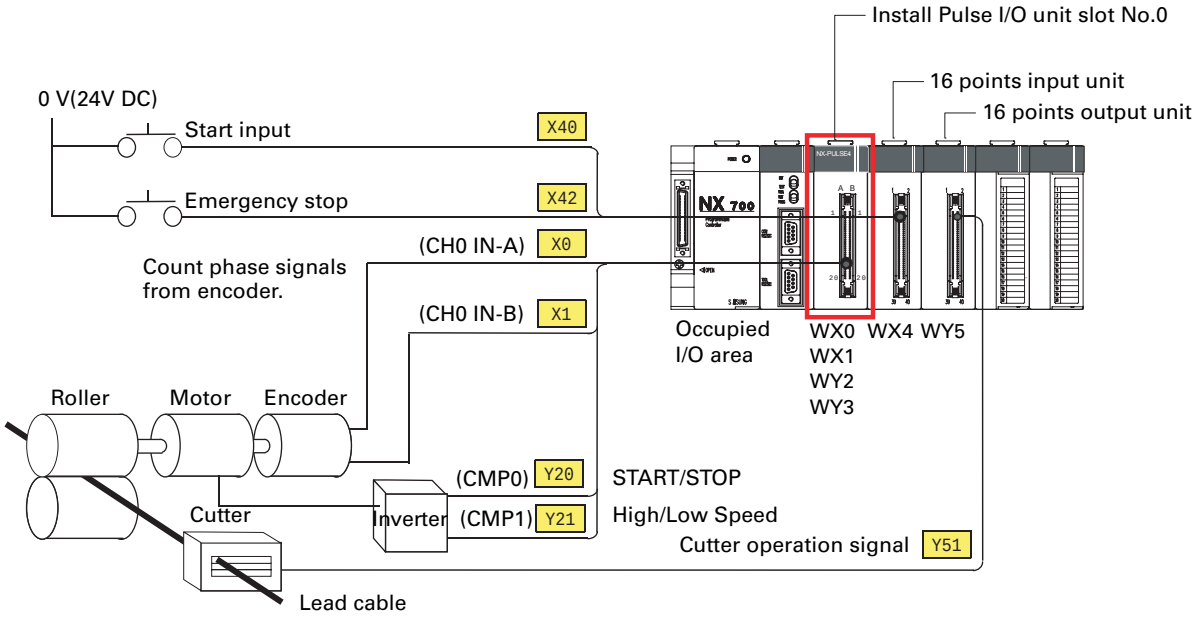

R9013
[F1 DMV, HFFFFFF20, DT0]
[F151 WRT, K0, DT0, K2, H100]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT0 to DT1
into Pulse I/O unit shared memory 100h to 101h.
Preparing data input
Data setting in DT0 to DT1
Shared memory input
Enter phase signals from encoder in X0 and X1, and enter 「FFFFFF20」in addresses 100h and 101h to use the counter in 1 multiplication phase input
R9013
[F1 DMV, K-16777216, DT0]
[F151 WRT, K0, DT0, K2, H108]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT0 to DT1
into Pulse I/O unit shared memory 108h and 109h.
Preparing data input
Data setting in DT0 to DT1
Shared memory input
Enter 「K-16777216」in addresses 108h and 109h to use a value that does not coincide with counter current value.
TO
TMX 0, K 10
0.1s Timer
Set K10 to use as 1s timer.
TO
[F150 READ, K0, H108, K2, DT2]
Assign Pulse I/O unit slot No.0
Input 2 words of data from current value h108 to h109 at CHO.
into data register DT2 to DT3 in CPU.
Reading shared memory
Read counter current value from shared memory 108h and 109h and store them in into DT2 and DT3 in CPU
[F1 DMV, K0, DT4]
[F151 WRT, K0, DT4, K2, H108]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT4 to DT5
into Pulse I/O unit shared memory addresses 108h to 109h.
Preparing data input
Data setting in DT4 to DT5
Shared memory input
Enter K0 in addresses 108h and 109h to reset counter current value.
[F31 D*, DT2 K3, DT6]
[F33 D%, DT6, K50, DT6]
Multiply by 32bit
Multiply 「K3」by the read counter current value and store the value in CPU module DT6.
Divide by 32bit
Divide DT6 value by 「K50」and store the value in CPU module DT6.

Stored value in data register

Address	Event
DT0, DT1	Target value
DT2, DT3	Current value
DT4, DT5	Initial value (0)
DT6, DT7	Rotation (RPM)

Fixed Length Processing

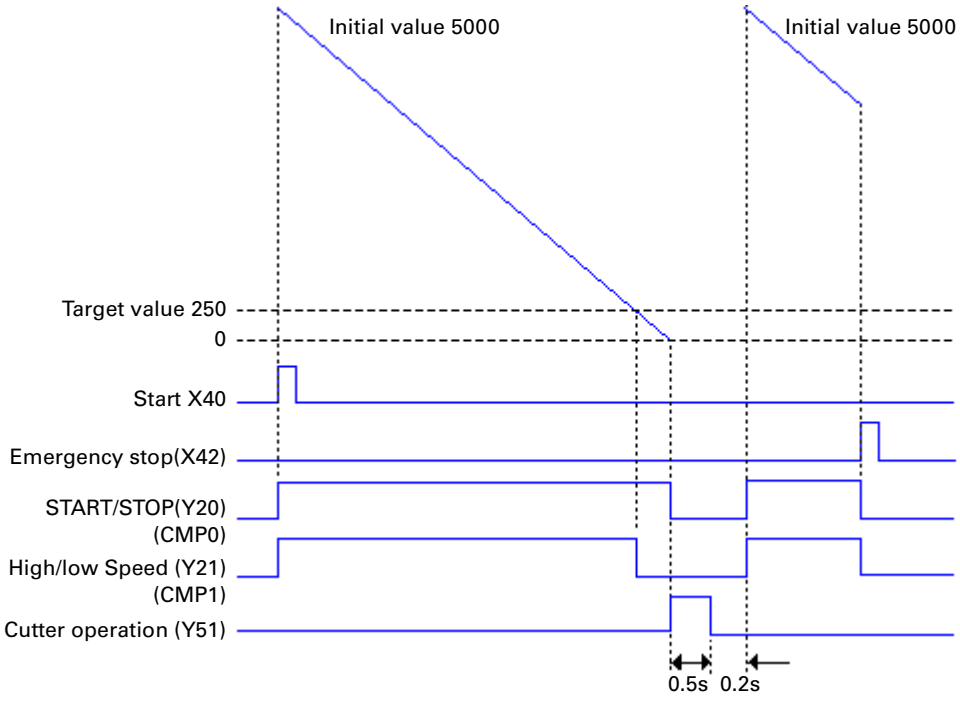
Overview



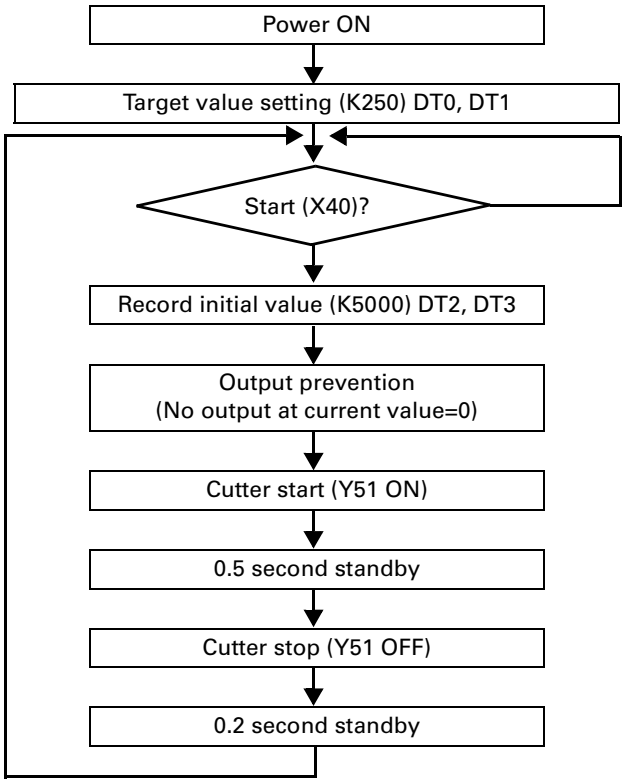
In the example, a transfer roller with diameter of 10cm and 10cm movement of lead cable by one rotation is used.
With this roller, slow the rotation when lead cable moves 95cm, and stop rotation at 100cm(10 rotations).
In this example, the resolution of encoder is 500 pulses/rotation. Also, pulse output is not used, and inverter start/stop are controlled by CMP0 signal, and high/low speed are controlled by CMP1 signal.

Time Chart

Count value and output change according to the input status of each signal as illustrated below.



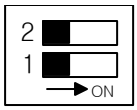
Flow Chart



Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)



No Interrupt function

- Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (ON/OFF) of interrupt function.

IMPORTANT In phase differential input mode, the input pulse magnification can change with multiplication function. See *"Parts and Functions" in Chapter 2*.

Shared Memory Setting

Counter setting

Setting the operation mode for each counter CH.
In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode, and therefore enter「FFFFFF20」to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32				16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase input	Terminal input

Counter Current Value Setting

Enter「K5000 (H1388)」as count initial value in the shared memory addresses 108h and 109h where the counter current value of CH0 is stored.

Shared Memory 108h, 109h Settings

(bit) 32				16 15			0
Setting item	Comparison output set value (for CMP0)							
Set value	F	F	0	0	1	3	8	8
Settings	K 5000							

Setting the Comparison Output Set Value

Setting the Comparison output set value to be compared with Counter current value.
In the example, enter「K0 (H0)」in shared memory addresses 120h, 121h and「K250 (H FA)」in 122h, 123h, to output CMP0 when counter current value is 0 and CMP1 when 250.

Shared memory 120h, 121h settings

(bit) 32				16 15			0
Setting item	Comparison output set value (for CMP0)							
Set value	0	0	0	0	0	0	0	0
Settings	K0							

Shared Memory 122h, 123h Settings

(bit) 32				16 15			0
Setting item	Comparison output set value (for CMP2)							
Set value	0	0	0	0	0	0	F	A
Settings	K250							

Setting the Comparison Output Set Value

Select the counter channel number and output logic for each comparison output point.
In the example, counter current value at CH0 is compared with comparison output set value and the result is output as CMP0 and CMP1. Therefore, enter「FFFFFF44」or「FFFFFF00」in shared memory addresses 104h and 105h.

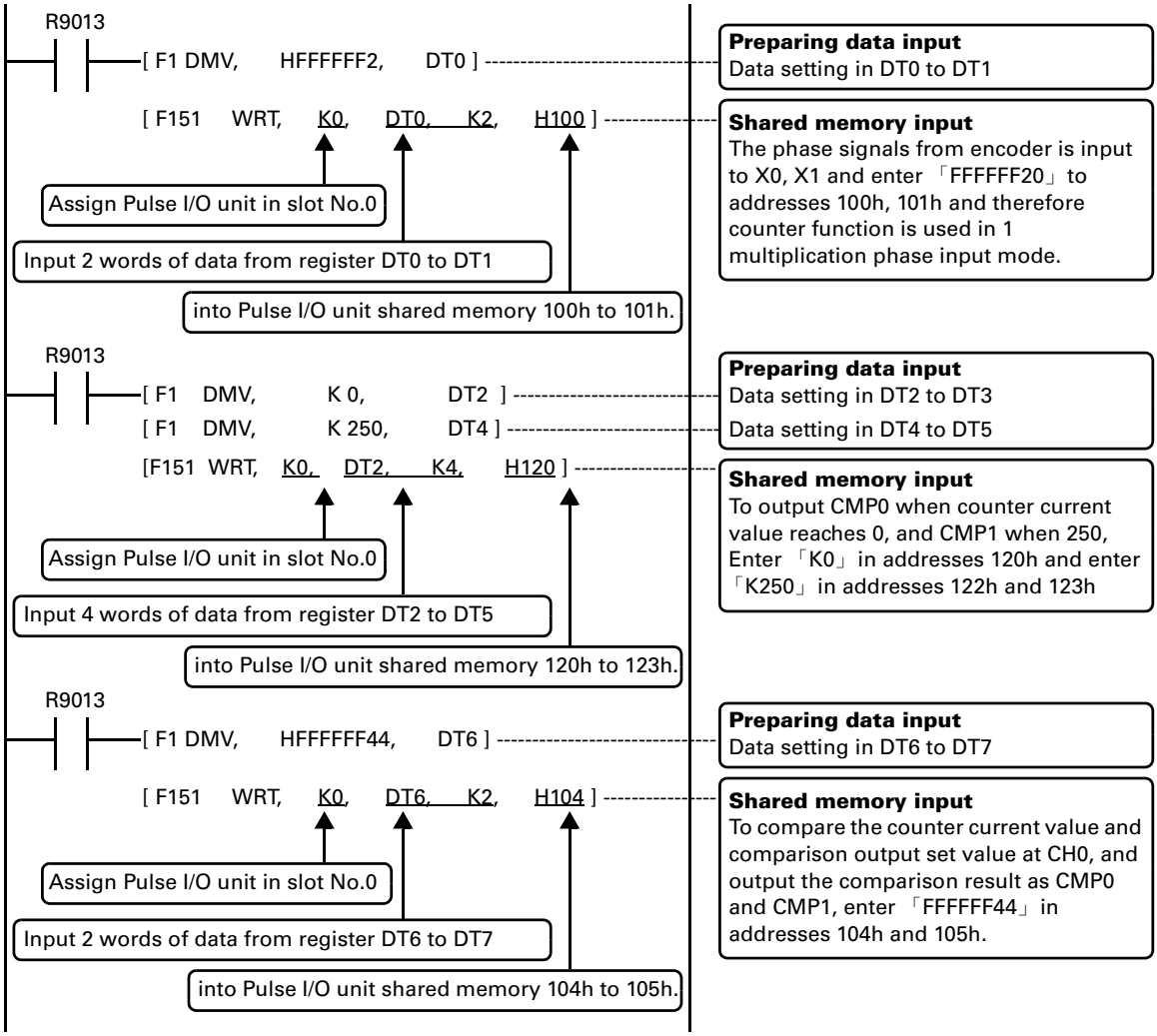
Shared memory 104h, 105h settings

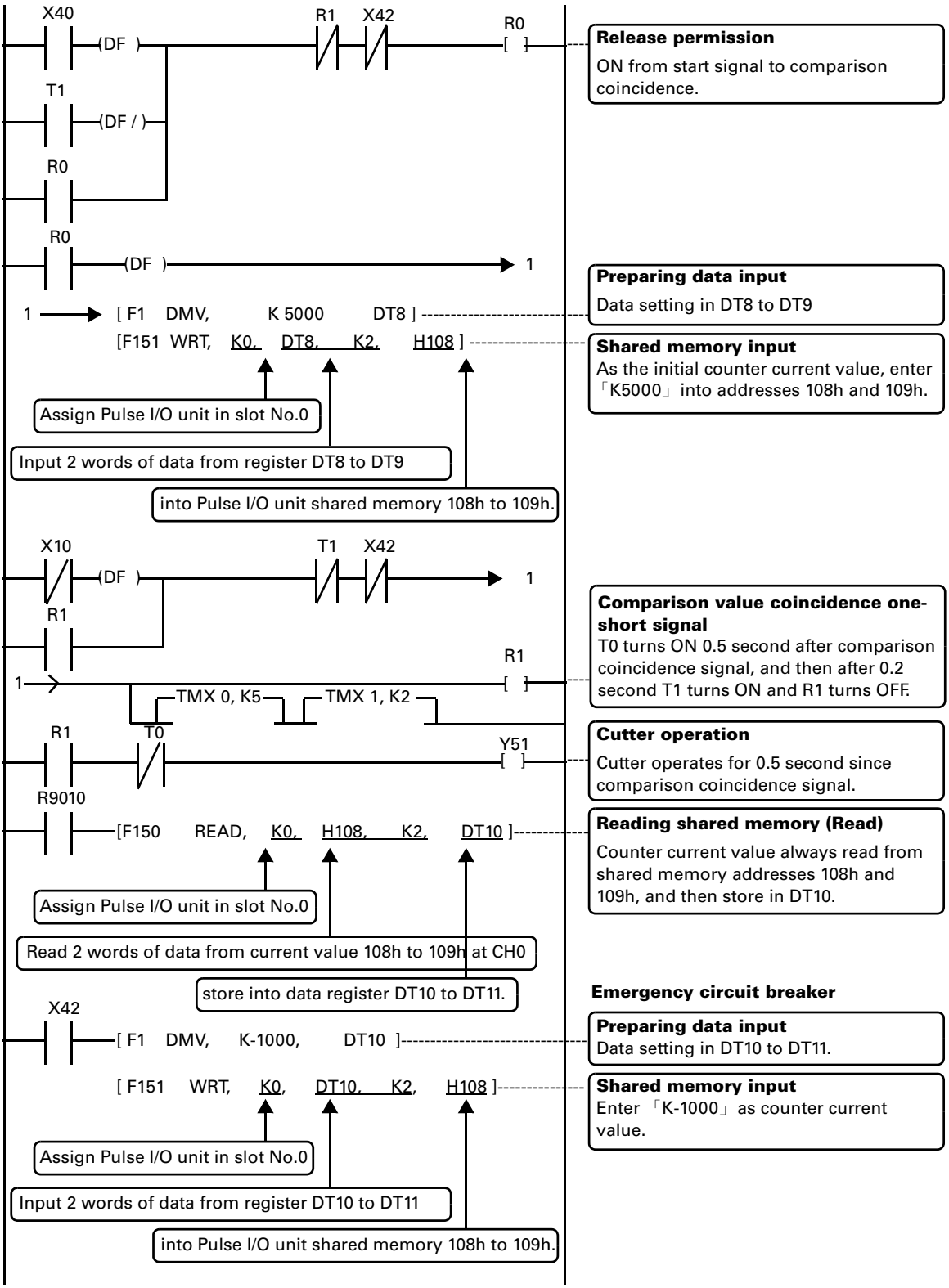
(bit) 32				16	15			0
Comparison Input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	4	4
Settings	Unused	Unused	Unused	Unused	Unused	Unused	CH0 * Comparison	CH0 * Comparison

* CMPO is ON when current value ≥ set value

Sample Program

In this example, counter and comparison function settings in shared memory will be made, and button operation program will be started.


R9013
[F1 DMV, HFFFFFF2, DT0]
Preparing data input
Data setting in DT0 to DT1
[F151 WRT, K0, DT0, K2, H100]
Shared memory input
The phase signals from encoder is input to X0, X1 and enter 「FFFFFF20」to addresses 100h, 101h and therefore counter function is used in 1 multiplication phase input mode.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT0 to DT1
into Pulse I/O unit shared memory 100h to 101h.
R9013
[F1 DMV, K 0, DT2]
[F1 DMV, K 250, DT4]
Preparing data input
Data setting in DT2 to DT3
Data setting in DT4 to DT5
[F151 WRT, K0, DT2, K4, H120]
Shared memory input
To output CMP0 when counter current value reaches 0, and CMP1 when 250, Enter 「K0」in addresses 120h and enter 「K250」in addresses 122h and 123h
Assign Pulse I/O unit in slot No.0
Input 4 words of data from register DT2 to DT5
into Pulse I/O unit shared memory 120h to 123h.
R9013
[F1 DMV, HFFFFFF44, DT6]
Preparing data input
Data setting in DT6 to DT7
[F151 WRT, K0, DT6, K2, H104]
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter 「FFFFFF44」in addresses 104h and 105h.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT6 to DT7
into Pulse I/O unit shared memory 104h to 105h.

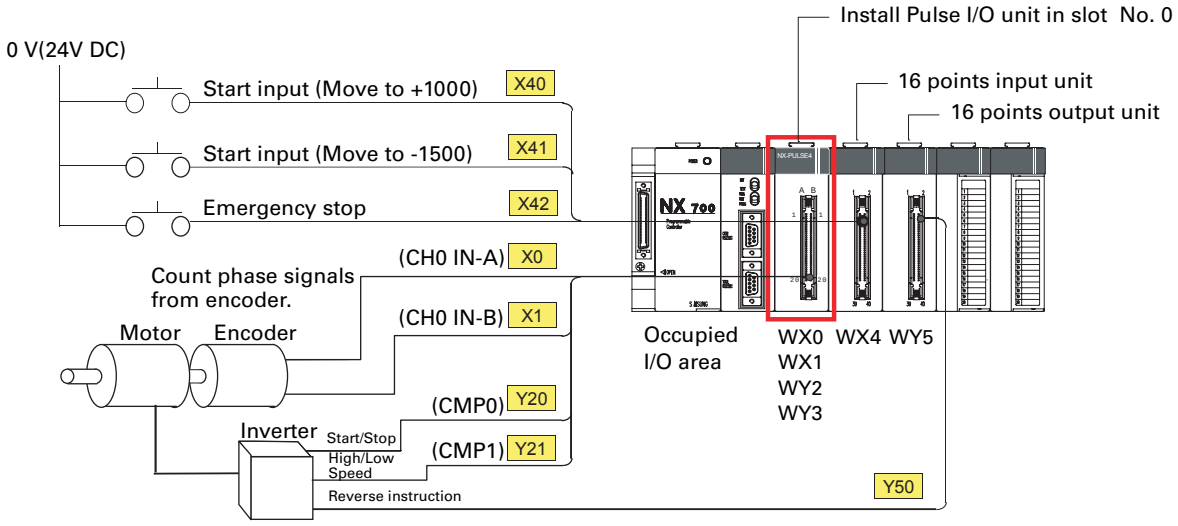

X40
(DF)
R1
X42
R0
[ ]
Release permission
ON from start signal to comparison coincidence.
T1
(DF /)
R0
R0
(DF)
1
1
[F1 DMV, K 5000 DT8]
Preparing data input
Data setting in DT8 to DT9
[F151 WRT, K0, DT8, K2, H108]
Shared memory input
As the initial counter current value, enter 「K5000」 into addresses 108h and 109h.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT8 to DT9
into Pulse I/O unit shared memory 108h to 109h.
X10
(DF)
T1
X42
1
R1
1
R1
[ ]
TMX 0, K5
TMX 1, K2
Comparison value coincidence one-short signal
T0 turns ON 0.5 second after comparison coincidence signal, and then after 0.2 second T1 turns ON and R1 turns OFF.
R1
T0
Y51
[ ]
Cutter operation
Cutter operates for 0.5 second since comparison coincidence signal.
R9010
[F150 READ, K0, H108, K2, DT10]
Reading shared memory (Read)
Counter current value always read from shared memory addresses 108h and 109h, and then store in DT10.
Assign Pulse I/O unit in slot No.0
Read 2 words of data from current value 108h to 109h at CH0
store into data register DT10 to DT11.
Emergency circuit breaker
X42
[F1 DMV, K-1000, DT10]
Preparing data input
Data setting in DT10 to DT11.
[F151 WRT, K0, DT10, K2, H108]
Shared memory input
Enter 「K-1000」 as counter current value.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT10 to DT11
into Pulse I/O unit shared memory 108h to 109h.

Stored Value in Data Register

Address	Event
DT2 to DT4	Target value
DT8 to DT9	Initial value
DT10 to DT11	Current value

Location Control by Absolute Value

Overview

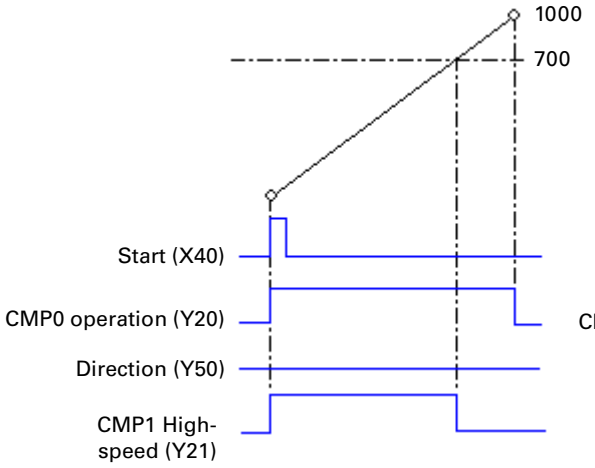


Location is controlled by absolute value. In this example, location changes to +1000 at X40 input and -1500 at X41 input, and then speed decreases before 300 pulses at the stop point, and finally everything stops. Also, pulse output is not used, and inverter start/stop are controlled by CMP0 signal, and high/low speed are controlled by CMP1 signal.

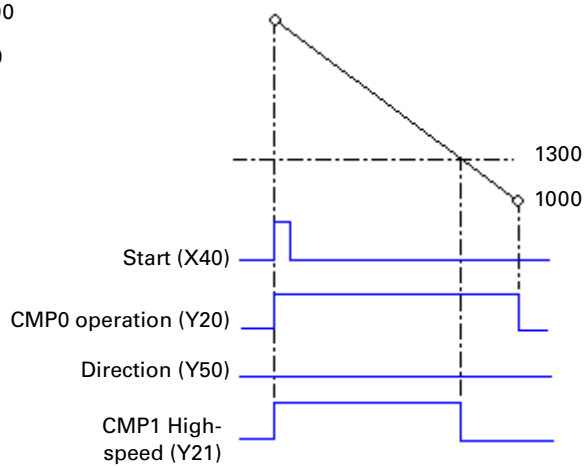
Time Chart

Count value and output change according to the input status of each signal as illustrated below.

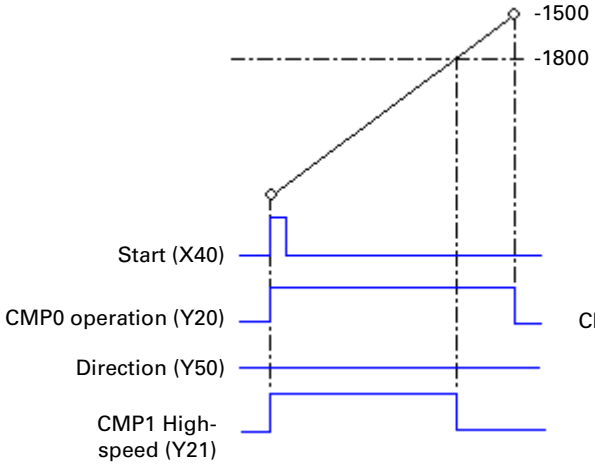
X40 ON Target value K1000
(Current value < Target value)



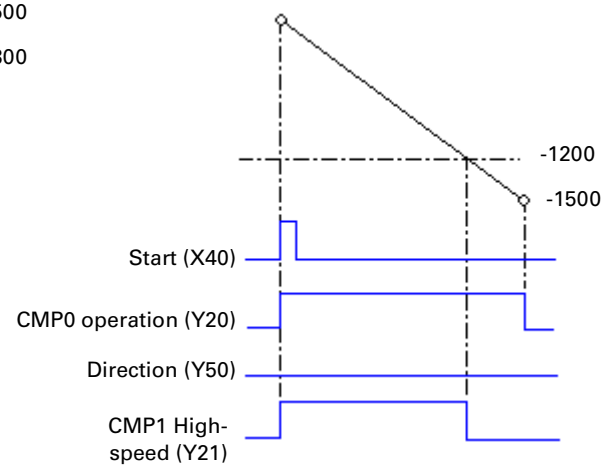
X40 ON Target value K1000
(Current value > Target value)



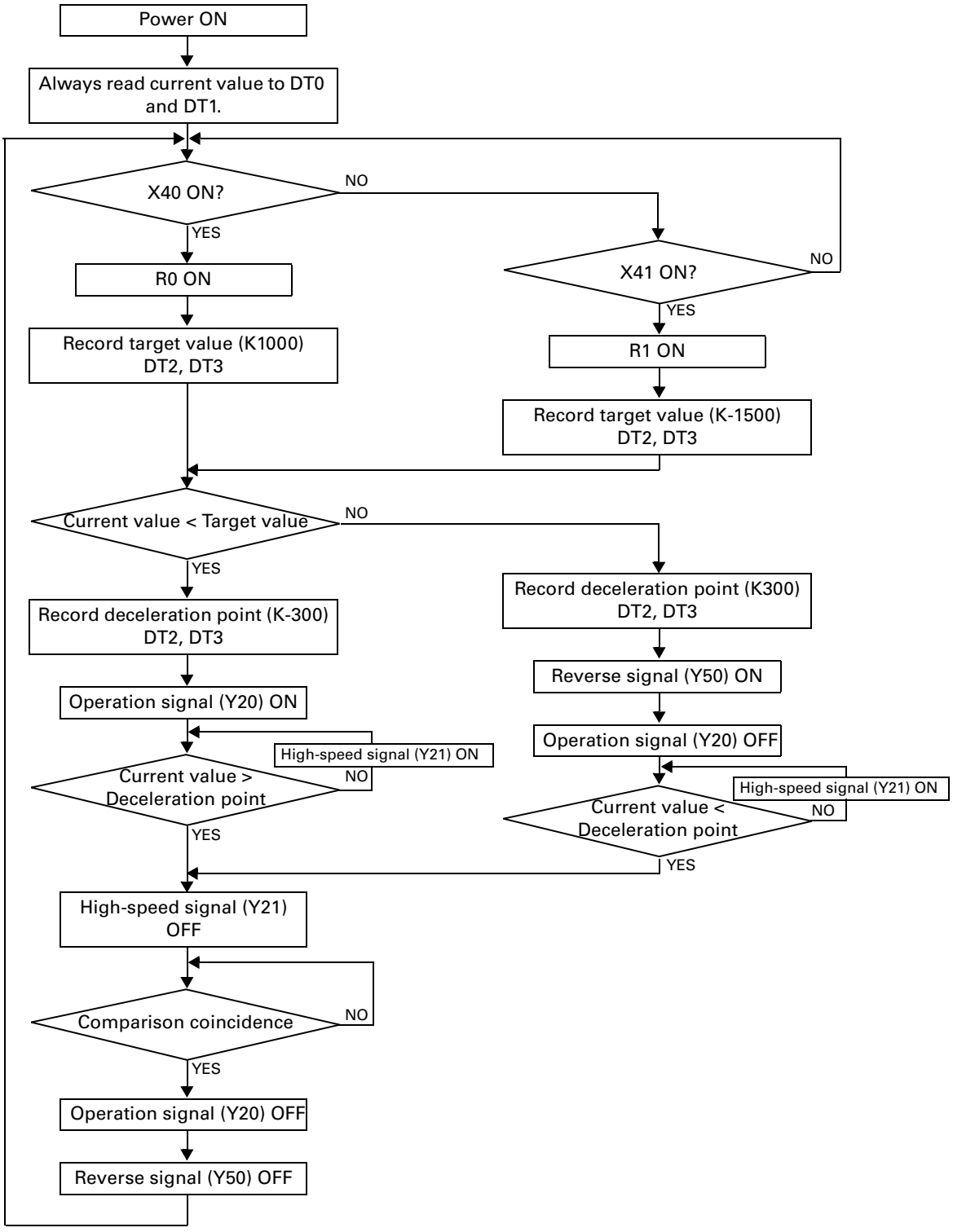
X41 ON Target value K-1500
(Current value < Target value)



X41 ON Target value K-1500
(Current value > Target value)



Flow Chart



IMPORTANT In phase differential input mode, the input pulse magnification can change with multiplication function.
See *"Chapter 2"* for details.

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)

No interrupt function

Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (OM/OFF) of interrupt function.

Shared Memory Setting

Counter Setting

Setting the operation mode for each counter CH.

In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode; therefore, enter 「FFFFFF20」 to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase input	Terminal Input

Setting the Comparison Output Set Value

Setting the Comparison output set value to be compared with Counter current value.

In this example, enter「K1000 (H 3E8)」 into shared memory addresses 120h and 121h when X40 turns ON, and 「K-1500 (H FFFFFA24)」 into 120h and 121h when X41 ON.

Shared Memory 120h, 121h Settings (X40 ON)

(bit) 32					16 15			0
Setting item	Comparison output set value (for CMP0)							
Set value	0	0	0	0	0	3	E	8
Settings	K 1000							

Shared Memory 120h, 121h Settings (X41 ON)

(bit) 32					16 15			0
Setting item	Comparison output set value (for CMP0)							
Set value	F	F	F	F	F	A	2	4
Settings	K-1500							

Setting the Comparison Output Point

Select the counter channel number and output logic for each comparison output point.

In the example, counter current value at CH0 is compared with comparison output set value, and the result is output at CMP0 and CMP1. Therefore, enter 「FFFFFF44」 or 「FFFFFF00」 in shared memory addresses 104h and 105h.

Shared Memory 104h, 105h Settings

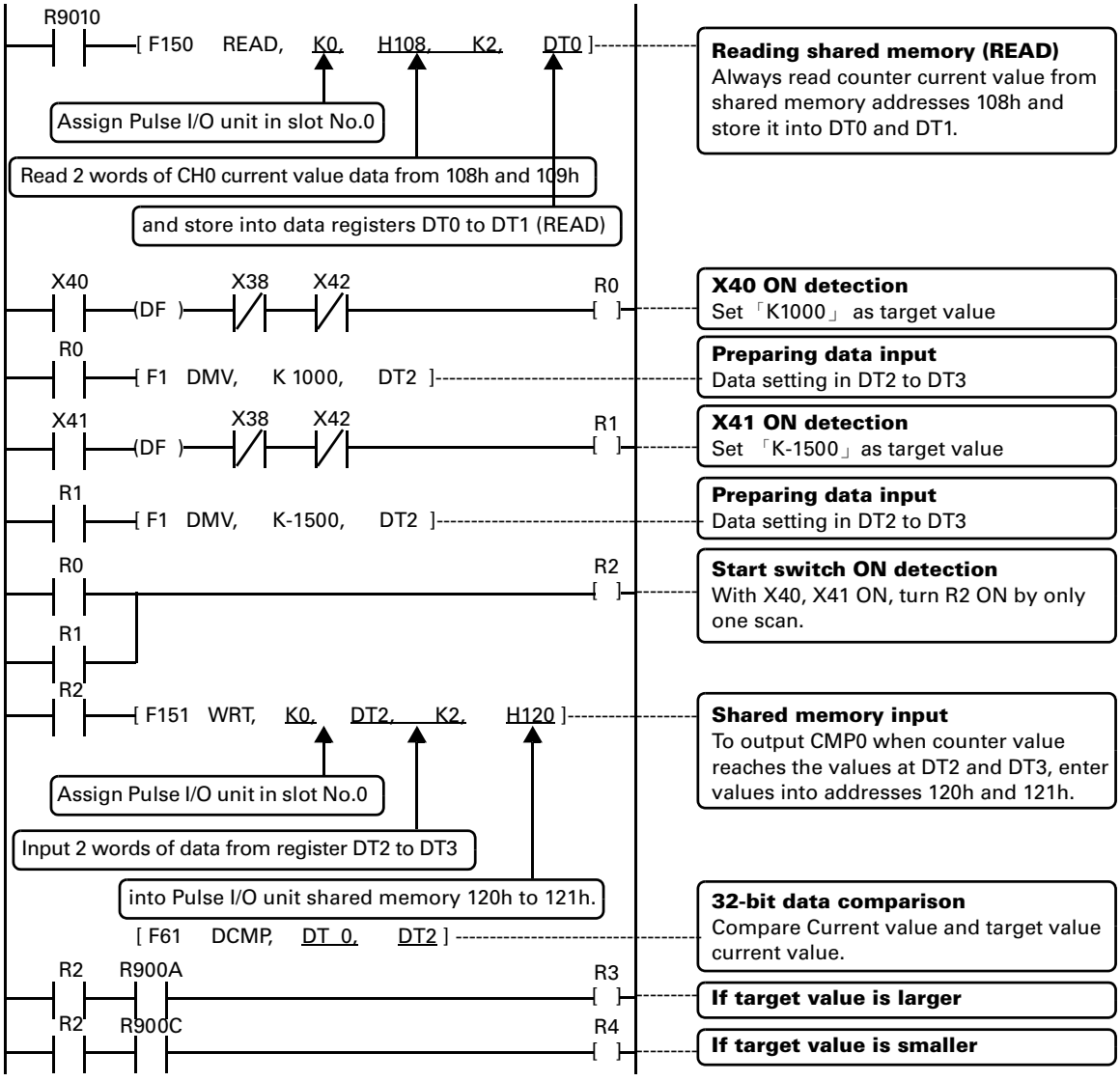
(bit) 32 16 15 0

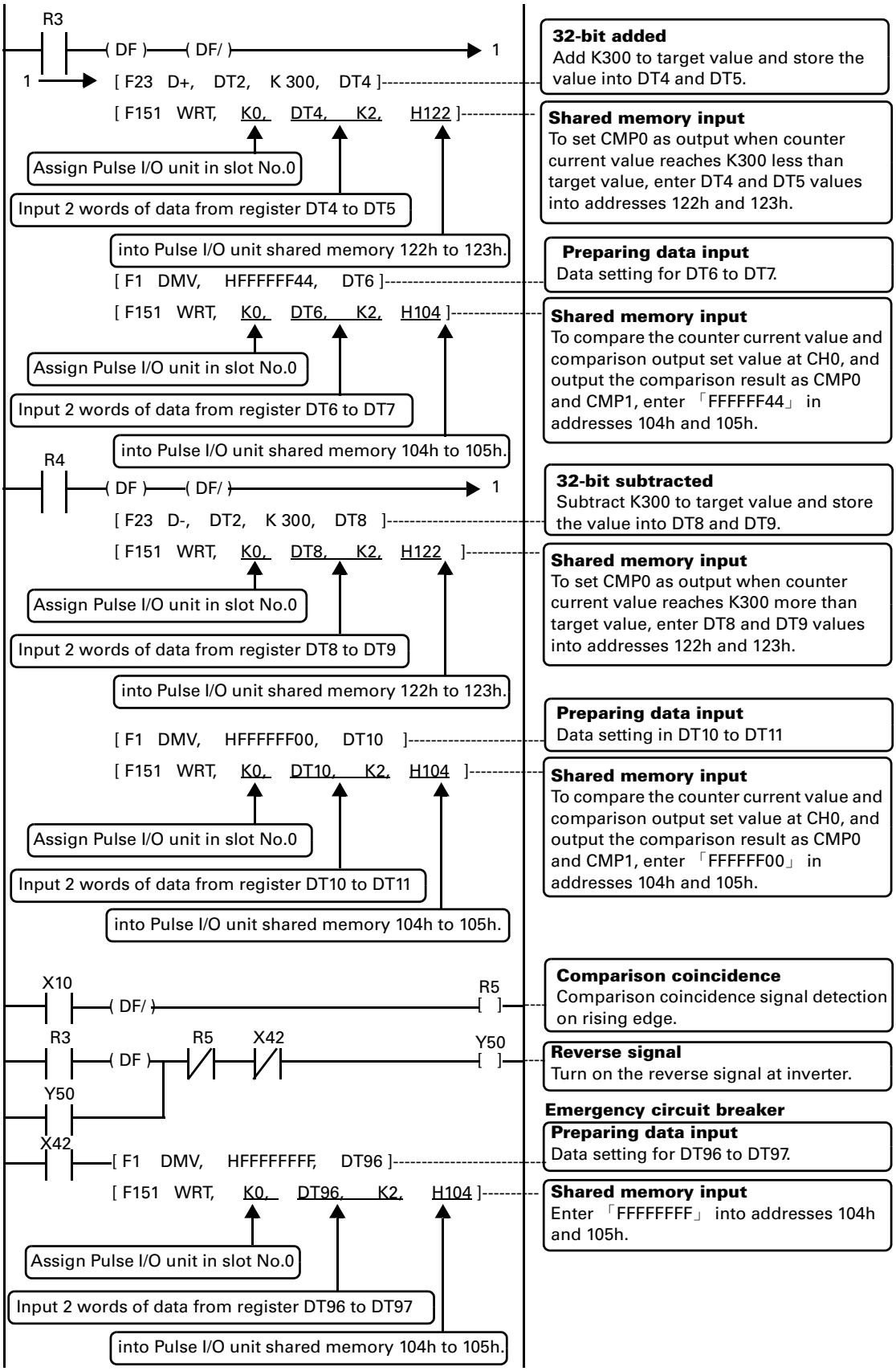
Comparison input	CMP7	CMP6	CMP5	CMP4	CMP3	CMP2	CMP1	CMP0
Set value	F	F	F	F	F	F	4	4
Settings	Unused	Unused	Unused	Unused	Unused	Unused	CH0 * Comparison	CH0 * Comparison

* CMPO is ON when current value ≥ set value

Sample Program

In this example, counter and comparison function settings in shared memory will be made, and button operation program will be started.


R9010
[F150 READ, K0, H108, K2, DT0]
Assign Pulse I/O unit in slot No.0
Read 2 words of CH0 current value data from 108h and 109h
and store into data registers DT0 to DT1 (READ)
Reading shared memory (READ)
Always read counter current value from shared memory addresses 108h and store it into DT0 and DT1.
X40 (DF) X38 X42 R0
X40 ON detection
Set 「K1000」 as target value
R0 [F1 DMV, K 1000, DT2]
Preparing data input
Data setting in DT2 to DT3
X41 (DF) X38 X42 R1
X41 ON detection
Set 「K-1500」 as target value
R1 [F1 DMV, K-1500, DT2]
Preparing data input
Data setting in DT2 to DT3
R0 R1 R2
Start switch ON detection
With X40, X41 ON, turn R2 ON by only one scan.
R2 [F151 WRT, K0, DT2, K2, H120]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT2 to DT3
into Pulse I/O unit shared memory 120h to 121h.
Shared memory input
To output CMP0 when counter value reaches the values at DT2 and DT3, enter values into addresses 120h and 121h.
[F61 DCMP, DT 0, DT2]
32-bit data comparison
Compare Current value and target value current value.
R2 R900A R3
If target value is larger
R2 R900C R4
If target value is smaller

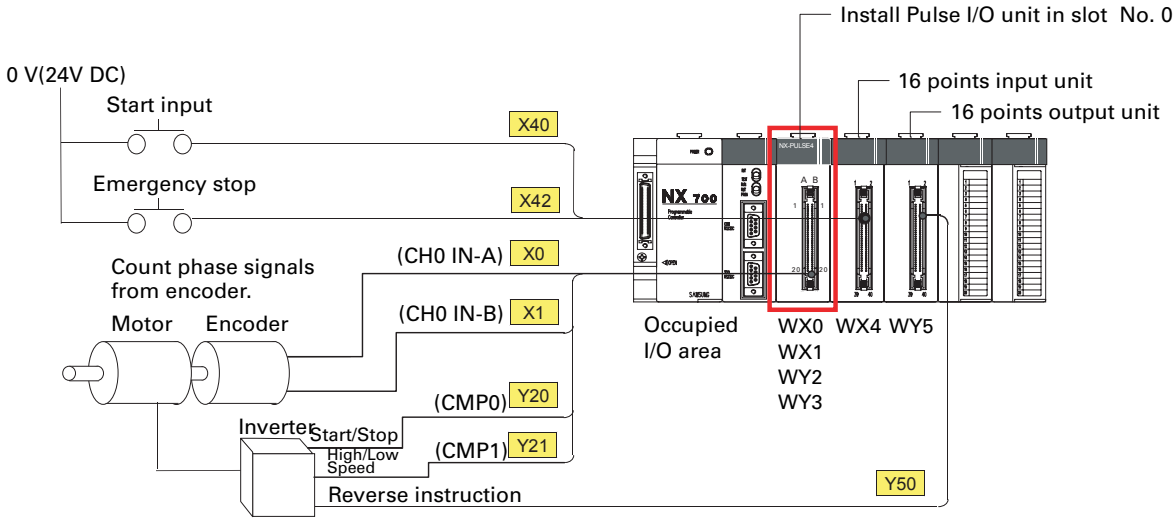

R3
(DF)
(DF/)
1
1
[F23 D+, DT2, K 300, DT4]
[F151 WRT, K0, DT4, K2, H122]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT4 to DT5
into Pulse I/O unit shared memory 122h to 123h.
[F1 DMV, HFFFFFF44, DT6]
[F151 WRT, K0, DT6, K2, H104]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT6 to DT7
into Pulse I/O unit shared memory 104h to 105h.
R4
(DF)
(DF/)
1
[F23 D-, DT2, K 300, DT8]
[F151 WRT, K0, DT8, K2, H122]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT8 to DT9
into Pulse I/O unit shared memory 122h to 123h.
[F1 DMV, HFFFFFF00, DT10]
[F151 WRT, K0, DT10, K2, H104]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT10 to DT11
into Pulse I/O unit shared memory 104h to 105h.
X10
(DF/)
R5
[ ]
R3
(DF)
R5
X42
Y50
[ ]
Y50
X42
[F1 DMV, HFFFFFFFF, DT96]
[F151 WRT, K0, DT96, K2, H104]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT96 to DT97
into Pulse I/O unit shared memory 104h to 105h.
32-bit added
Add K300 to target value and store the value into DT4 and DT5.
Shared memory input
To set CMP0 as output when counter current value reaches K300 less than target value, enter DT4 and DT5 values into addresses 122h and 123h.
Preparing data input
Data setting for DT6 to DT7.
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter 「FFFFFF44」 in addresses 104h and 105h.
32-bit subtracted
Subtract K300 to target value and store the value into DT8 and DT9.
Shared memory input
To set CMP0 as output when counter current value reaches K300 more than target value, enter DT8 and DT9 values into addresses 122h and 123h.
Preparing data input
Data setting in DT10 to DT11
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter 「FFFFFF00」 in addresses 104h and 105h.
Comparison coincidence
Comparison coincidence signal detection on rising edge.
Reverse signal
Turn on the reverse signal at inverter.
Emergency circuit breaker
Preparing data input
Data setting for DT96 to DT97.
Shared memory input
Enter 「FFFFFFFF」 into addresses 104h and 105h.

Stored value in data register

Address	Event
DT0, DT1	Current value
DT2, DT3	Target value
DT4, DT5	Deceleration point
DT8, DT9	Deceleration point

Location Control by Data Table

Overview



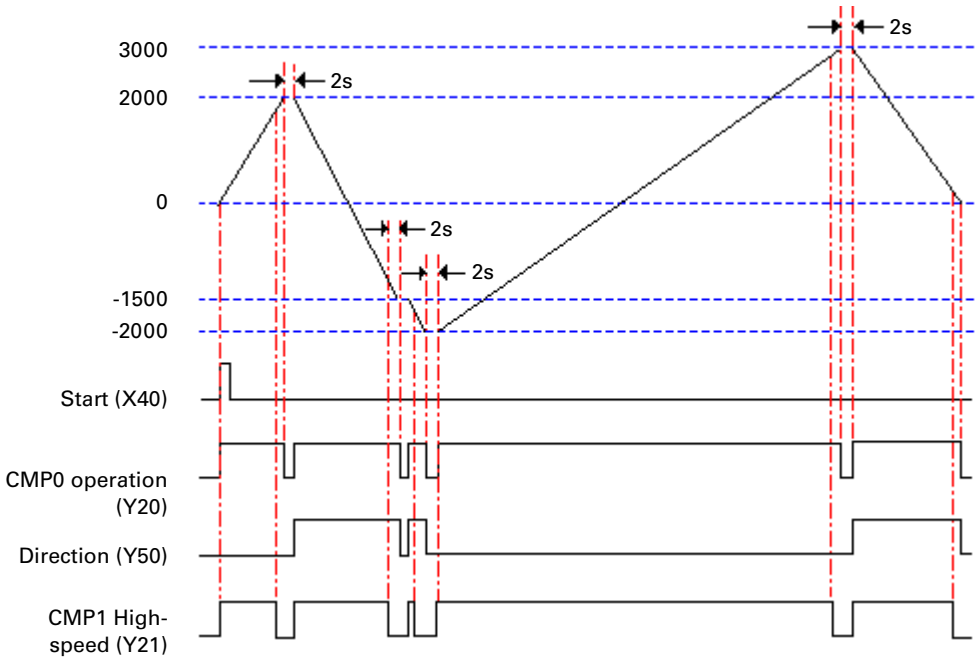
In the example, location is controlled as absolute values according to the set values in data table.
Speed decreases before 300 pulses at the stop point, and finally all stop. Data table is organized as follows, and deceleration point value (relative pulse value) is also registered.

Address	Set value	Event
DT10, DT11	K 300	Speed turning point
DT12, DT13	K 2000	Target value 1
DT14, DT15	K -1500	Target value 2
DT16, DT17	K -2000	Target value 3
DT18, DT19	K 3000	Target value 4
DT20, DT21	K 0	Target value 5

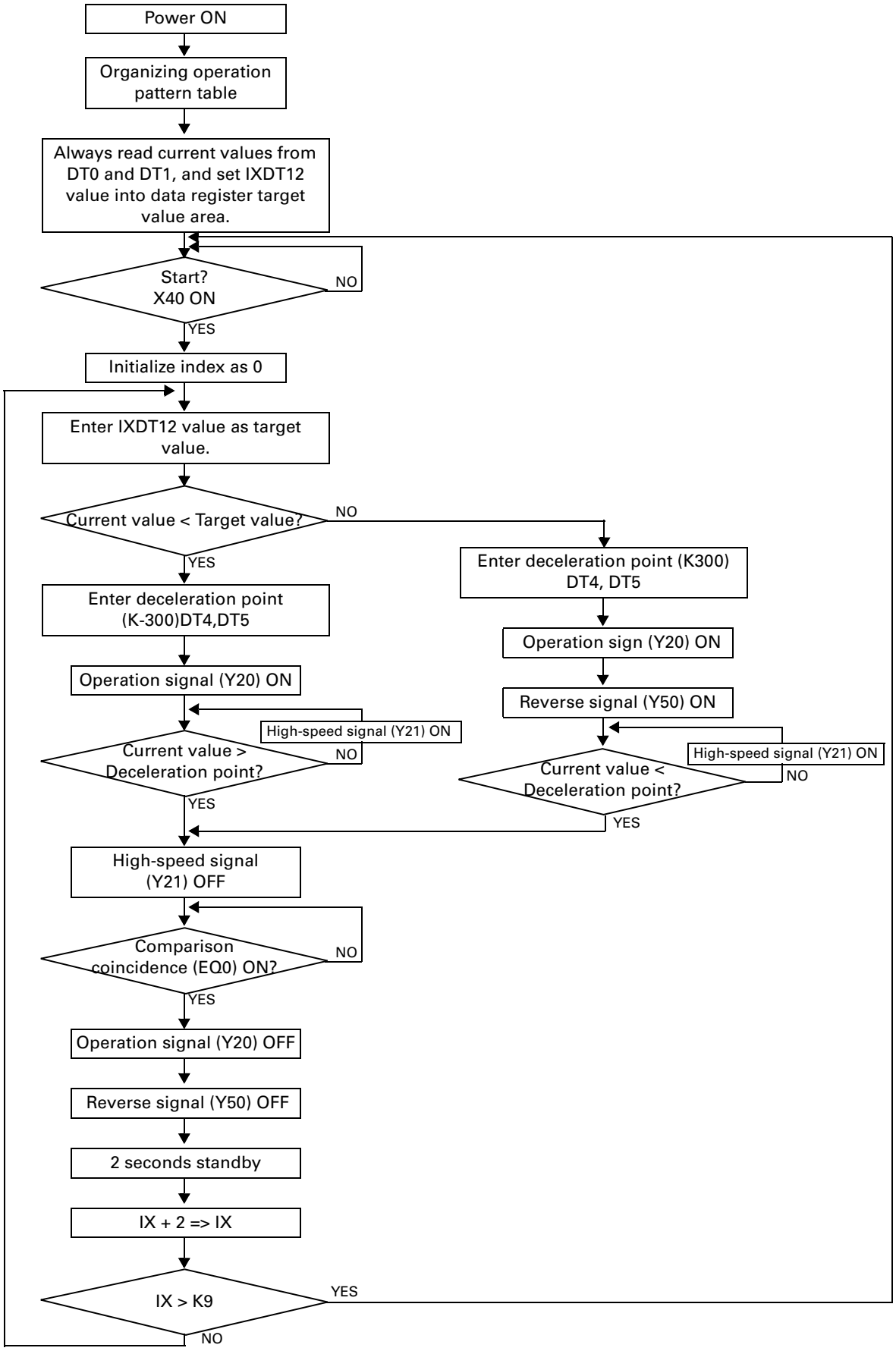
Also, pulse output is not used, and inverter start/stop are controlled by CMP0 signal, and high/low speed are controlled by CMP1 signal.

Time Chart

Count value and output change according to the input status of each signal as illustrated below.
Deceleration starts K300 pulses prior to each target value.



Flow Chart


Power ON
Organizing operation pattern table
Always read current values from DT0 and DT1, and set IXDT12 value into data register target value area.
Start? X40 ON
NO
YES
Initialize index as 0
Enter IXDT12 value as target value.
Current value < Target value?
NO
YES
Enter deceleration point (K-300)DT4,DT5
Operation signal (Y20) ON
High-speed signal (Y21) ON
Current value > Deceleration point?
NO
YES
Enter deceleration point (K300) DT4, DT5
Operation sign (Y20) ON
Reverse signal (Y50) ON
High-speed signal (Y21) ON
Current value < Deceleration point?
NO
YES
High-speed signal (Y21) OFF
Comparison coincidence (EQ0) ON?
NO
YES
Operation signal (Y20) OFF
Reverse signal (Y50) OFF
2 seconds standby
IX + 2 => IX
IX > K9
YES
NO

Mode Setting Switch Setting

Set to Mode A when interrupt function is not in use.

Mode A (SW1 →OFF, SW2 →OFF)

No interrupt function

Interrupt function is not available at this setting.

* Count function can be used regardless of the use status (ON/OFF) of interrupt function.

Shared Memory Setting

Counter Setting

Setting the operation mode for each counter CH.
In the example, the phase signal from encoder is input to X0 and X1, and counter function is used in 1 multiplication phase input mode; therefore, enter 「FFFFFF20」 to shared memory addresses 100h and 101h.

Shared Memory 100h, 101h Settings

(bit) 32					16 15			0
External input	XD	XC	X9	X8	X5	X4	X1	X0
Counter number	CH3		CH2		CH1		CH0	
Setting item	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting	Input mode	Functions setting
Set value	F	F	F	F	F	F	2	0
Settings	Unused	Unused	Unused	Unused	Unused	Unused	Phase input	Terminal input

Setting the Comparison Output Set Value

Setting the operation mode for each counter CH.
In the example,「K2000(H 7D0)」,「K-1500(H FFFFFA24)」,「K-2000(H FFFFF830)」,「K3000(H BB8)」,「K0(H 0)」are input to shared memory addresses 120h and 121h in sequential order.

Shared Memory 120h, 121h Settings (Target Value 1)

(bit) 32					16 15			0
Setting item	Comparison output set value (for CMP0)							
Set value	0	0	0	0	0	2	D	0
Settings	K 2000							

Shared Memory 120h, 121h Settings (Target Value 2)

(bit) 32					16 15			0
Setting item	Comparison output set value (for CMP1)							
Set value	F	F	F	F	F	A	2	4
Settings	K-1500							

Shared Memory 120h, 121h Settings (Target Value 3)

(bit) 32	16	15	0
Setting item	Comparison output set value (for CMP0)		
Set value	F F F F F 8 3 0		
Settings	K -2000		

Shared Memory 120h, 121h Settings (Target Value 4)

(bit) 32	16	15	0
Setting item	Comparison output set value (for CMP0)		
Set value	0 0 0 0 0 B B 8		
Settings	K 3000		

Shared Memory 120h, 121h Settings (Target Value 5)

(bit) 32	16	15	0
Setting item	Comparison output set value (for CMP0)		
Set value	0 0 0 0 0 0 0 0		
Settings	K 0		

Setting the Comparison Output Point

Select the counter channel number and output logic for each comparison output point.
In the example, counter current value at CH0 is compared with comparison output set value, and the result is output at CMP0 and CMP1. Therefore, enter「FFFFFF44」or「FFFFFF00」in shared memory addresses 104h and 105h.

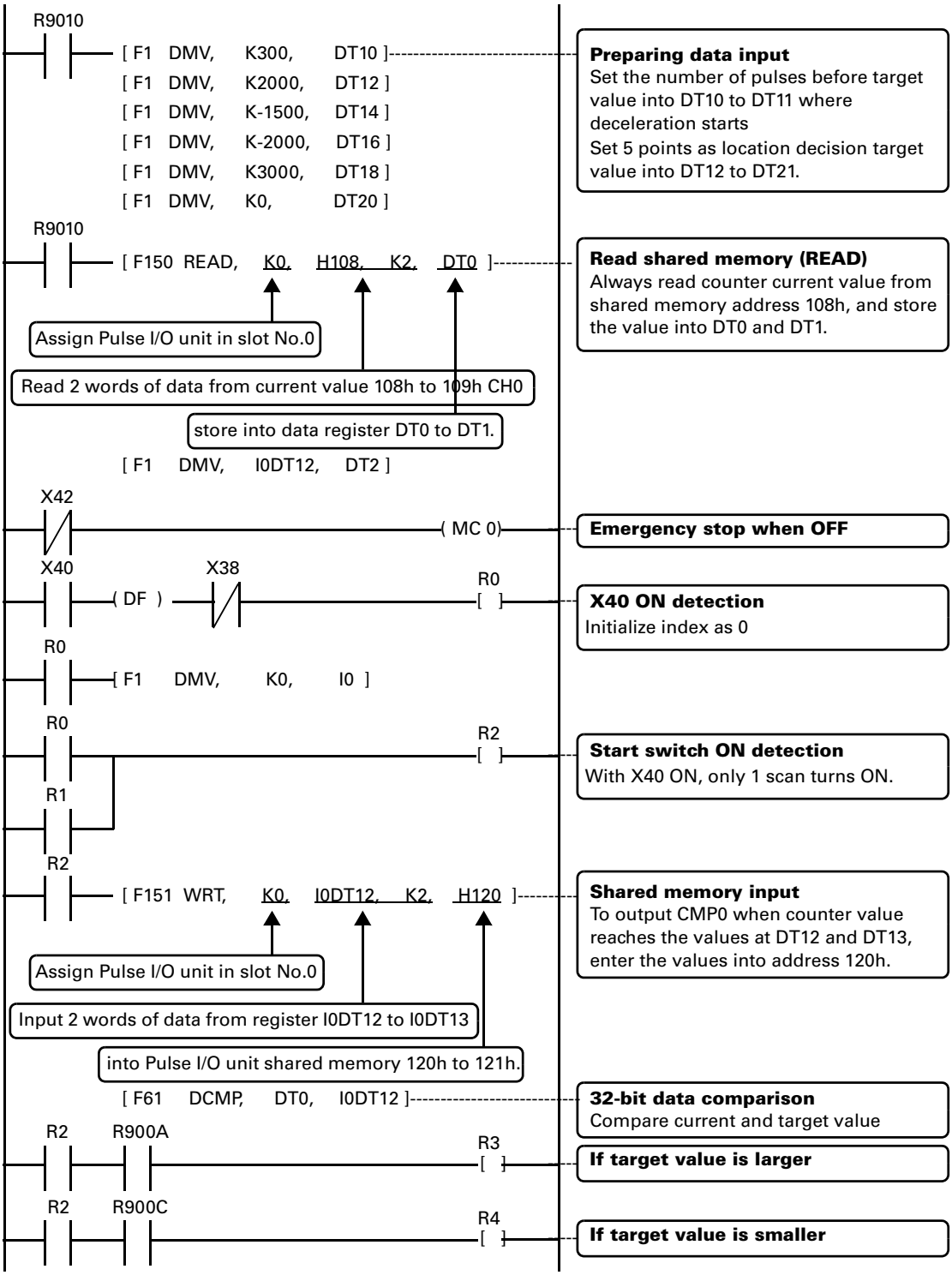
Shared Memory 104h, 105h Settings

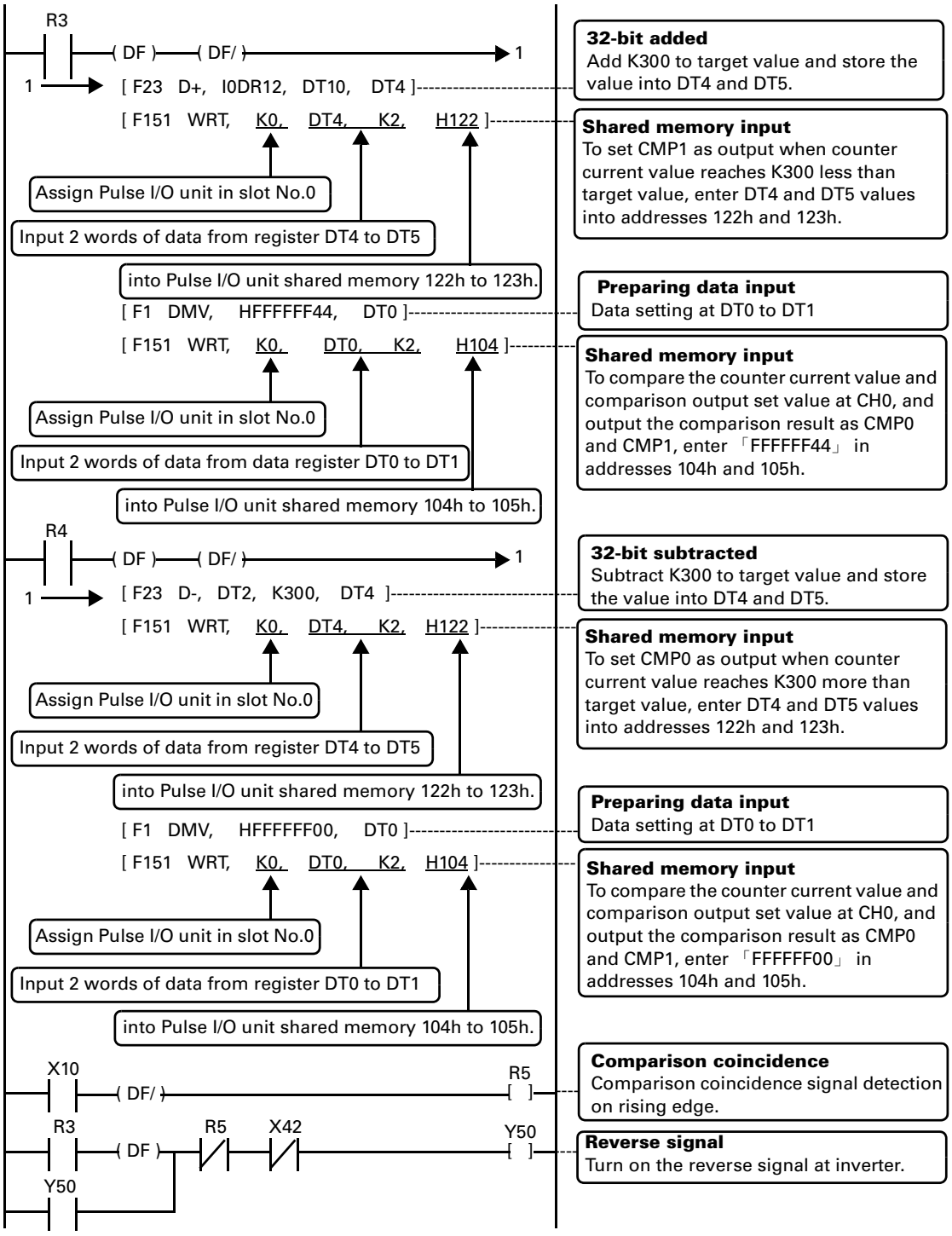
(bit) 32	16	15	0
Comparison input	CMP7 CMP6 CMP5 CMP4 CMP3 CMP2 CMP1 CMP0		
Set value	F F F F F F 4 4		
Settings	Unused Unused Unused Unused Unused Unused CH0 * Comparison	CH0 * Comparison	

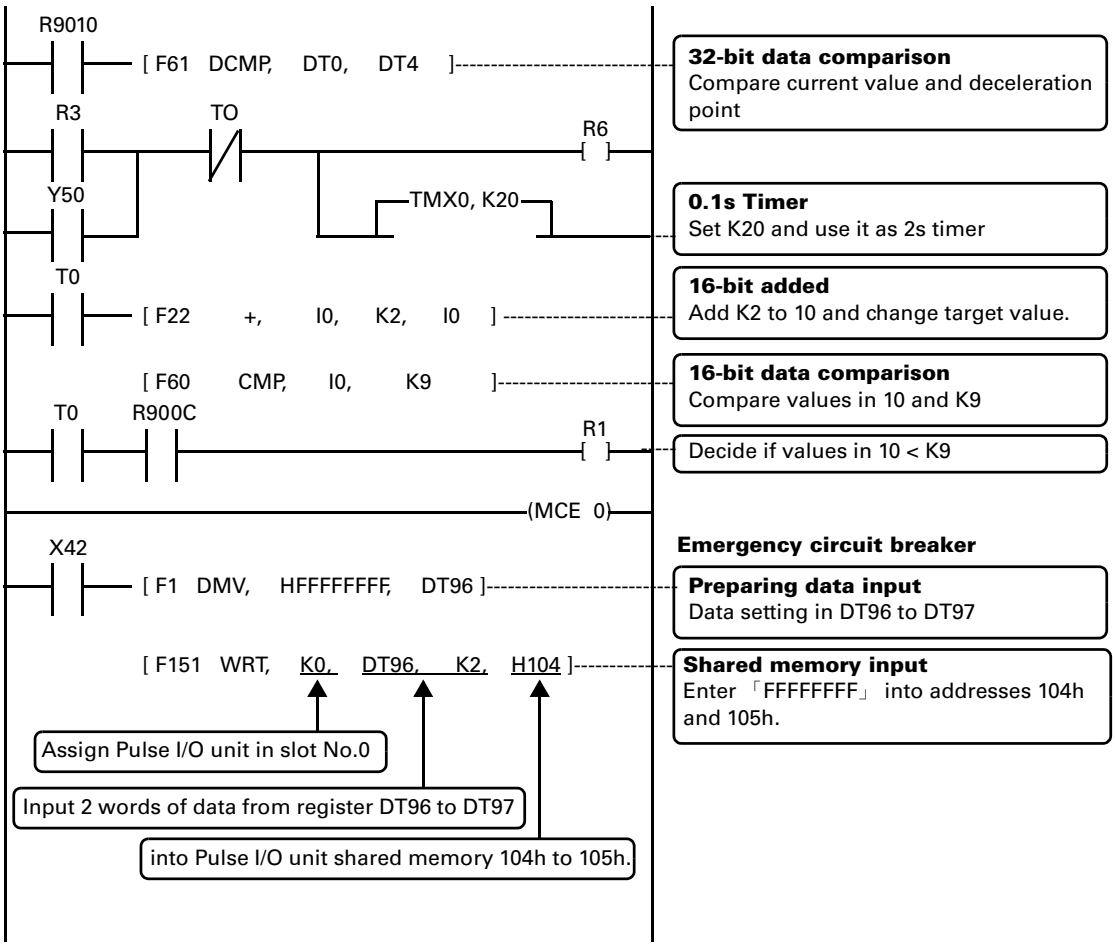
* CMPO is ON when current value ≥ set value

Sample Program

In this example, counter and comparison function settings in shared memory will be made, and button operation program will be started.


R9010
[F1 DMV, K300, DT10]
[F1 DMV, K2000, DT12]
[F1 DMV, K-1500, DT14]
[F1 DMV, K-2000, DT16]
[F1 DMV, K3000, DT18]
[F1 DMV, K0, DT20]
Preparing data input
Set the number of pulses before target value into DT10 to DT11 where deceleration starts
Set 5 points as location decision target value into DT12 to DT21.
R9010
[F150 READ, K0, H108, K2, DT0]
Read shared memory (READ)
Always read counter current value from shared memory address 108h, and store the value into DT0 and DT1.
Assign Pulse I/O unit in slot No.0
Read 2 words of data from current value 108h to 109h CH0
store into data register DT0 to DT1.
[F1 DMV, I0DT12, DT2]
X42
(MC 0)
Emergency stop when OFF
X40
(DF)
X38
R0
[ ]
X40 ON detection
Initialize index as 0
R0
[F1 DMV, K0, I0]
R0
R2
[ ]
Start switch ON detection
With X40 ON, only 1 scan turns ON.
R1
R2
[F151 WRT, K0, I0DT12, K2, H120]
Shared memory input
To output CMP0 when counter value reaches the values at DT12 and DT13, enter the values into address 120h.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register I0DT12 to I0DT13
into Pulse I/O unit shared memory 120h to 121h.
[F61 DCMP, DT0, I0DT12]
32-bit data comparison
Compare current and target value
R2
R900A
R3
[ ]
If target value is larger
R2
R900C
R4
[ ]
If target value is smaller


R3
(DF)
(DF/)
1
1
[F23 D+, I0DR12, DT10, DT4]
[F151 WRT, K0, DT4, K2, H122]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT4 to DT5
into Pulse I/O unit shared memory 122h to 123h.
[F1 DMV, HFFFFFF44, DT0]
[F151 WRT, K0, DT0, K2, H104]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from data register DT0 to DT1
into Pulse I/O unit shared memory 104h to 105h.
R4
(DF)
(DF/)
1
1
[F23 D-, DT2, K300, DT4]
[F151 WRT, K0, DT4, K2, H122]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT4 to DT5
into Pulse I/O unit shared memory 122h to 123h.
[F1 DMV, HFFFFFF00, DT0]
[F151 WRT, K0, DT0, K2, H104]
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT0 to DT1
into Pulse I/O unit shared memory 104h to 105h.
X10
(DF/)
R5
[ ]
R3
(DF)
R5
X42
Y50
[ ]
Y50
32-bit added
Add K300 to target value and store the value into DT4 and DT5.
Shared memory input
To set CMP1 as output when counter current value reaches K300 less than target value, enter DT4 and DT5 values into addresses 122h and 123h.
Preparing data input
Data setting at DT0 to DT1
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter 「FFFFFF44」 in addresses 104h and 105h.
32-bit subtracted
Subtract K300 to target value and store the value into DT4 and DT5.
Shared memory input
To set CMP0 as output when counter current value reaches K300 more than target value, enter DT4 and DT5 values into addresses 122h and 123h.
Preparing data input
Data setting at DT0 to DT1
Shared memory input
To compare the counter current value and comparison output set value at CH0, and output the comparison result as CMP0 and CMP1, enter 「FFFFFF00」 in addresses 104h and 105h.
Comparison coincidence
Comparison coincidence signal detection on rising edge.
Reverse signal
Turn on the reverse signal at inverter.


R9010
[F61 DCMP, DT0, DT4]
32-bit data comparison
Compare current value and deceleration point
R3
TO
R6
Y50
TMX0, K20
0.1s Timer
Set K20 and use it as 2s timer
T0
[F22 +, I0, K2, I0]
16-bit added
Add K2 to 10 and change target value.
[F60 CMP, I0, K9]
16-bit data comparison
Compare values in 10 and K9
T0
R900C
R1
Decide if values in 10 < K9
(MCE 0)
Emergency circuit breaker
X42
[F1 DMV, HFFFFFFFF, DT96]
Preparing data input
Data setting in DT96 to DT97
[F151 WRT, K0, DT96, K2, H104]
Shared memory input
Enter 「FFFFFFFF」 into addresses 104h and 105h.
Assign Pulse I/O unit in slot No.0
Input 2 words of data from register DT96 to DT97
into Pulse I/O unit shared memory 104h to 105h.

Stored value in data register

Address	Event
DT0, DT1	Current value
DT2, DT3	Current target value
DT4, DT5	Deceleration point (Absolute value)
DT10, DT11	Deceleration point (Absolute value)
DT12, DT13	Target value 1
DT14, DT15	Target value 2
DT16, DT17	Target value 3
DT18, DT19	Target value 4
DT20, DT21	Target value 5

NX70/NX700 Series Pulse I/O Modules (4CH) (NX70-PULSE4 and NX-PULSE4) User Manual

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